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Prefatory Note on the Issue "Quantity and Quality"

THE FIRST FIVE articles in this issue review a classic problem, long debated as Quantity versus Quality, in the light of contemporary research in several fields, from mathematics and physics, through experimental psychology and economics, to political and legal analysis. These present a striking concurrence in the view that the ancient dichotomy obscures more than it clarifies, and that contemporary scholarship has achieved a functional rapport between the quantitative and the qualitative.

Appropriately enough, John G. Kemeny opens with a paper on dequantified mathematics. Concerned with testing the utility of mathematical analysis on realistic, multidimensional problems, Kemeny avoids philosophical issues, and presents four specific models applicable to problems current in the social sciences. As Victor F. Weisskopf shows in the next essay, in quantum physics the question of sort and size, mode and measure, is ultimately understood in terms of the difference between discreteness and continuity.

Whereas S. S. Stevens recounts the impressive progress in the quantification of sensation made despite "the troop of old ghosts" defensively clustered "around the issue of privacy," the next two writers, Wassily Leontief and Harold D. Lasswell, deal with the problem of Quantity and Quality on a level on which individual reactions to discrete stimuli cannot be resolved. These contributors are concerned with two key systems of social life: the economic system of distributing wealth, and the political system of distributing power. An economist can deal with aggregates of human behavior by defining two quantifiable devices by which the effective behavior of all individuals must be limited, i. e., the production function and the consumption function. In political science, however, as Lasswell points out, the "challenge to translate special conceptions with operational indexes" is far from being met. On the contrary, he warns of the impasse that every science faces if it formalizes its empirical substance exclusively through dichotomous concepts. Lasswell's advocacy of a "configurational method" is intended as a challenge to

the view that political behavior is not amenable to realistic and systematic scientific scrutiny; he proposes a multidimensional "event-manifold" in which each variable can be handled independently, although its full meaning derives from the complete ensemble.

The papers by Kemeny, Weisskopf, Leontief, and Lasswell were originally delivered this year as lectures in the second Hayden Colloquium of the Massachusetts Institute of Technology. The Hayden Colloquium is sponsored by the graduate program in political and social science, with the support of Dean John E. Burchard, and is under the direction of Professor Daniel Lerner, who has served as guest editor for these four essays.

Mathematics Without Numbers

JOHN G. KEMENY

A HUNDRED years ago a mathematician would have defined mathematics as "the study of number and space." Indeed, the Thorndike-Barnhart *Dictionary* published in 1956 still defines mathematics as the "science dealing with numbers and the measurement, properties, and relationships of quantities." The study of numbers led to the development of algebra, and the study of space to geometry. These two disciplines merged in the calculus, the crowning glory of classical mathematics. A significant feature of modern mathematics is that such a definition is much too narrow to include its newer branches.

Classical mathematics was ideally suited for the development of physics. Indeed, it arose from physics in many cases. For innumerable problems in physics on which measurements are readily available, the physicist may use a numerical model. On other problems the physicist is concerned with the nature of physical space, and thus classical geometry is suitable as a model. Even when Euclidean geometry proved to be no longer adequate for the needs of modern physics, Einstein was able to use a mathematical model which combined a non-Euclidean geometry with methods of the calculus. This type of model still fits the description of mathematics as the study of number and space.

The social sciences may be characterized by the fact that in most of their problems numerical measurements seem to be absent and considerations of space are irrelevant. I would like to consider in this paper ways in which mathematical models may be used in connection with typical problems in the social sciences.

Let us consider why a scientist employs mathematical models. First of all, the language of mathematics is a convenient form in which to formulate scientific theories. It forces the theoretician in various sciences to formulate his hypotheses in a precise and unambiguous form. It also forces him to strip the scientific problem of all accidental details. Once the model is formulated in its abstract form, it becomes a branch of mathematics. If the scientist is fortunate, this branch of mathematics will have been studied by mathematicians previously, and then theorems proven in this field become available

as predictions for the scientist. For the axioms of the mathematical system, when interpreted, represent scientific theories, and hence the theorems, when interpreted in the same way, are logical consequences of the scientist's theories. In this way the mathematician will have accomplished the logical analysis of scientific theories for the scientist.

It has often been pointed out that the mathematical theorem adds nothing to the hypotheses from which it is deduced. Indeed, if a theorem added to the content of the hypotheses, it would not follow logically from them, and hence it would not be a theorem of the branch of mathematics. However, theorems, though not new in content, may be psychologically new to the scientist, and very often are. In effect, the mathematician says to the scientist, "Did you know that your assumptions imply such and such?" And very often this will come as a pleasant (or unpleasant) surprise to the scientist. The mathematician has bridged the gap between original assumptions and verifiable predictions. He has enabled the scientist to test his hypotheses, and often enables him to make pragmatically significant predictions about the future.

But it sometimes happens that the mathematical model formulated by the scientist does not correspond to any known branch of mathematics. In this case the scientist either must create a new branch of mathematics or must appeal to the mathematician to undertake this task for him. For example, when Newton formulated his Laws of Motion, he found that there was no branch of mathematics suitable for the treatment of his new model. He had to turn to the method of the calculus that he invented. The social scientist today often finds the mathematician unable to enlighten him on the particular model of interest to him. Many mathematicians have the impression that mathematical problems in the social sciences are entirely trivial. On the contrary, most problems in the social sciences are too difficult for present-day mathematics. It is because the problems arising in the social sciences rapidly become difficult that only some of the very simplest mathematical problems have been solved so far.

There is every reason to expect that the various social sciences will serve as incentives for the development of great new branches of mathematics and that some day the theoretical social scientist will have to know more mathematics than the physicist needs to know today.

There are essentially two different ways in which a mathematical model may be formed for a problem that does not involve numbers or space. The first method is to use a branch of mathematics which itself does not employ numbers and does not deal with space. The second method is to introduce numbers by a more or less arbitrary method, where no numbers were at first apparent. Then it may be possible to form a significant numerical model of a nonnumerical problem. Two examples of each of these approaches will be discussed in detail below.

The examples to be discussed will employ methods either from modern algebra or from modern geometry. To give a maximum variety to these examples, one algebraic and one geometric model will be discussed for each of the two possible approaches to nonnumerical problems.

Model No. 1

Our first model will employ graph theory, which is a branch of modern geometry, but it may be said to be in no way relevant to the study of space. Thus we will discuss a geometric example of a model in which the problem, to start with, is nonnumerical and nonspatial, and the model formed remains so. The problem to be considered is that of structural balance in a social group.[1]

We consider a social group with certain information concerning likes and dislikes between pairs of individuals. A graph is a convenient mathematical language in which to represent such a structure.

A *graph* is defined as a set of points with lines connecting some, though not necessarily all, pairs of points. We may allow some of these lines to have arrows on them indicating directions, in which case we speak of a *directed graph*. We may also allow plus and minus signs on some of these lines, in which case we speak of a *signed graph*. If persons A and B are represented by two points, then an arrow from A to B with a plus sign might indicate that A likes B, and one with a minus sign might indicate that A dislikes B. If there is no arrow from A to B, then A is indifferent to B (see Figure 1).

Figure 1

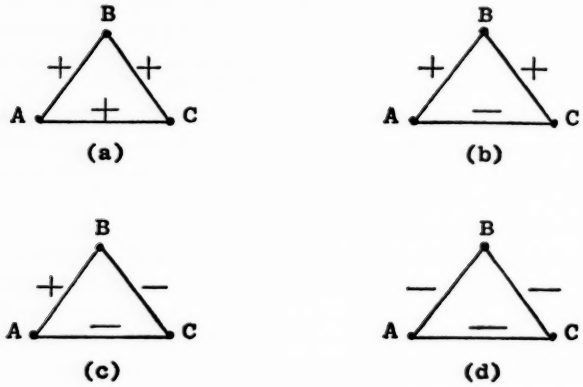

Figure 2

In the problem to be considered we will be interested in conditions under which a social group is in "balance." If A likes B but B does not like A, then there is a lack of balance. The first necessary condition for balance will be that B should always hold the same relation to A that A holds to B. Therefore we need not employ directed graphs; ordinary signed graphs will serve our purpose. These graphs, which have no arrows on the line segments, are suitable for symmetric relations.

Figure 2 represents the possible signed graphs for three people if no person is indifferent to any other person. In (a), where everyone likes everyone else, the social group is balanced. In (b), where person B likes both the others, but these two dislike each other, there is an unbalanced situation. In (c), A and B like each other and each of them dislikes the third person. This is again a balanced situation. Graph (d) represents a situation in which everyone dislikes everyone else. This may be considered to be unbalanced, as there will be strong forces for pairs of individuals to form a coalition against the third one. It may be observed that the graphs with an even number of minus signs are balanced and the graphs with an odd number of minus signs are unbalanced.

Cartwright and Harary searched the literature for examples in which social scientists had labeled social groups "balanced" or "unbalanced." They noted that all these situations satisfied the following

definition: if we take a *cycle* within a graph to be a path starting at A and ending at A, we then define a signed graph to be *balanced* if every cycle in it has an even number of minus signs.

Since this definition subsumed every example they found in the literature, and since it provided a complete definition of balanced social structures, they proposed it as a general definition of structural balance in a social group. Of course it remains for the social scientists to decide whether this is a general satisfactory definition. Let us assume for the moment that it is.

We now have a mathematical model for structural balance in a social group. Since we have the tools of graph theory available to us, let us search for a theorem of graph theory that would lead to an interesting conclusion concerning social groups. Such an example is the *structure theorem* for signed graphs. This theorem may be stated as follows: a signed graph is balanced if, and only if, it is possible to subdivide the points into two sets, such that all positive connections occur between points in the same set and all negative connections occur between points in different sets.

This theorem has a most interesting interpretation in terms of political science. Let us suppose that we have a political body with likes, dislikes, and indifferences between pairs of members. Or, if we prefer, we may replace likes by "ability to get along politically." Let us say that "it is possible to impose a two-party structure" on the political body if there is a method of dividing the members of the political body into two parties, so that any one member likes members only of his own party and dislikes members only of the other party. This holds under the alternate interpretation if any one member can get along only with members of his own party and fails to get along politically only with members of the opposing party. Then the structure theorem says simply that a political body is balanced if, and only if, it is possible to impose a two-party structure on it.

This result, which may be surprising to the social scientist, is a good example of the pure mathematician contributing a useful theorem.

Model No. 2

The second model employs group theory, a branch of modern algebra in which numbers need play no role at all. Specifically, we will be concerned with a group of transformations.

A *group of transformations* may be characterized as follows: we are given a set of objects S and a certain collection G of "changes" on S. That is, each element of G may be used to change an object of S into some other (or possibly the same) object of S. For these transformations G to form a *group*, two conditions must be satisfied. First, the changes must come in pairs: for every transformation g_1 there must be a transformation g_2, so that g_2 always undoes what g_1 did, and vice versa. That is, if g_1 changes an object s into an object t, then g_2 must change the object t into the object s. The second condition is that the result of performing two transformations, one after the other, should again be a transformation within G. Thus if g_1 takes s into t, and g_2 takes t into u, then g_3 will change s directly into u. This may be thought of simply as a mental attitude on our part, in that we always decide to include the "combined transformation" g_3 in our collection G.

The reader will note the extremely general nature of the concept of a group of transformations. Yet there is a vast literature on groups of transformations, and hence a tremendous number of theorems that may be employed any time such a group is available to us.

Marriage rules in primitive societies have been studied from a mathematical point of view by André Weil and Robert R. Bush.[2] The marriage rules in certain primitive societies are designed to prevent marriage between close relatives, even when these relatives are not aware of the fact that they are related. This is desirable in a society where no exact records are kept and where family ties may soon be forgotten. The basic rule is that each person in the society is assigned a certain "marriage type" and that a man may marry a woman only if she is of his own type. Given the type of the parents, each son is assigned one definite type and each daughter is assigned another definite type.

We immediately see that brother-sister marriages are automatically forbidden in this society, since a son from a given marriage is always assigned a different type from that of a daughter.

Our basic set of objects is the set of marriage types. Our transformations will be rules according to which we find the type of a relative of a person, knowing the type of the person. Since a relative of a relative is again a relative, the result of applying two transformations will again be a transformation. Furthermore, if there is a transformation changing the type of an uncle to that of a nephew, there should also be a transformation that changes the type of a nephew

to that of an uncle, and hence both conditions are satisfied for having a group of transformations.

Among the conditions of reasonableness for marriage types, the two most important conditions not yet mentioned are: "For any two individuals it is permissible for some of their descendants to intermarry"; and "The rule as to whether a man is allowed to marry a female relative of a given kind depends only on the kind of relationship." The former assures that the society does not split into castes, and the latter assures that there is no discrimination against a given marriage type.

We now have a mathetical model for marriage rules in primitive societies, and we may search the mathematical literature for appropriate theorems applicable to this problem. The basic result is that the marriage group must be a regular permutation group which is generated by the parent-to-son transformation and by the parent-to-daughter transformation. Since regular permutation groups are relatively rare, this theorem enables one to find easily all possible marriage rules for a given number of marriage types. For example, it is shown that there are but six possible sets of rules for a society having four marriage types. It is then interesting to note that two of these are actually in use in the Tarau and the Kariera societies respectively.

For example, in the Kariera society, the parent-to-son transformation interchanges types 1, 2, and 3, 4, while the parent-to-daughter transformation reverses the order of the types (see the table below). If we have parents of type 2, a son will have type 4, and his daughters will have type 1. A daughter of the original parents will have type 3, and her sons will also have type 1. Hence a son of the daughter of given parents will be allowed to marry the daughter of a son. The same is true no matter what type the grandparents are.

TYPE NUMBERS IN KARIERA SOCIETY

Parents	Son	Daughter
1	3	4
2	4	3
3	1	2
4	2	1

The model also suggests certain additional questions one may not have thought of in an informal formulation of the problem. For example, both the above-mentioned societies allow certain first-cousin marriages, though other first-cousin marriages are forbidden. It would be reasonable to impose an additional restriction that first-cousin marriages should always be forbidden. In this case one can prove that the necessary and sufficient condition for this is that parent-to-son and parent-to-daughter transformations should not commute and that their squares should not be equal. These additional conditions eliminate all regular groups with less than six types. Therefore we find that the Kariera and Tarau societies could not possibly have eliminated all first-cousin marriages if they wanted to use only four types.

This example is historically very interesting and illuminating. It is most impressive that a society that is unable to keep precise records should have been able to solve, through trial and error, a problem that requires fairly intricate mathematical operations for formal analysis. It also shows, however, that their procedures could have been considerably improved if they had been in a position to use modern algebra to design the rules. For example, they could have eliminated all first-cousin marriages.

We have just considered models in which numbers are not used and in which no geometry occurs. Now we shall consider others in which numbers or geometric concepts are artificially introduced: Model No. 3 will be numerical and Model No. 4 geometrical.

Model No. 3

Let us consider a communication network. By this we mean a set of people with certain means of sending messages from one to the other. For each pair of people i and j it may be possible to send a message from i to j, from j to i, in both directions, or in neither direction. It would at first appear that this is a situation in which no numbers could ever be usefully introduced. However, a simple numerical model for communication networks has proved fruitful.

We introduce a square array of numbers, known as a matrix, which has as many rows and columns as there are people in our network. Let us call this matrix C and let us call the entry in the ith row and the jth column $c_{i,j}$; $c_{i,j}$ will be chosen to be 1 if it is possible to send a message directly from i to j; otherwise $c_{i,j} = 0$. In particular, we will

always choose $c_{i,i} = 0$, which is merely a convention. (That is, by definition, a person cannot send himself a message.)

It is immediately clear that all the information available to us about the communication network is furnished by the matrix. However, any number of other methods could be thought of that would represent this information just as well. Has anything been gained by introducing numbers? Numbers are truly useful only if arithmetical operations are introduced. For example, matrices can be multiplied; in particular, we can multiply the matrix C by itself. According to the customary rules of matrix multiplication, we will then find that the entry in the ith row in the jth column of the new matrix will give us the number of different ways in which i can send a message to j in two steps.

In Figure 3 we show communication matrix C for a network of four people in which 1 can communicate directly with 2, 2 can communicate directly with all three of the others, 3 can communicate directly with 4, and 4 can communicate directly with 1 and 3. We also show in the same figure C^2, which indicates the number of ways a given man can communicate with other men in two steps. For example, 2 can communicate with each man in two steps in just one way.

$$C = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix} \qquad C^2 = \begin{pmatrix} 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix}$$

Figure 3

The fruitfulness of such a model might of course be judged in terms of theorems that can be proved about it. An interesting theorem[3] concerns a complete communication network. By this we mean that, for each pair of people i and j, it is possible to send a message either from i to j, or from j to i, or in both directions. For such a complete communication network there is a simple interpretation for having the largest number of ones in a given row. For example, in Figure 3 (which shows a complete network) man 2 has the largest row sum, namely 3. The proof shows that the person whose row in the matrix has the largest row sum can communicate with everyone in the network in one or two steps. Of course, in Figure 3 man 2 can actually do this in a single step.

This system has an interesting mathematical feature known as duality—namely, by interchanging rows and columns it is possible to change a matrix of "can send a message to" to a matrix of "can receive a message from." The above-quoted theorem is still applicable to the dual matrix, and hence we know that if a given person's column sum is a maximum, then this person can receive a message from everybody in one or two steps. In our example, columns 1, 3, and 4 all have maximal column sum 2, and hence all three of these men can be reached by any man in one or two steps.

These results do not appear very surprising when there are only four men in our network; but when we consider a complex network of a hundred people, they may be very useful indeed. For example, an efficiency expert studying a large firm may find a communication matrix a convenient means for representing either the communication system or the table of organization of the company. Should he find that the company forms a complete communication network, he could immediately search for the hub of command from which instructions can be given in one or two steps to any employee. And even if the network is incomplete, studying powers of the communication matrix would provide valuable information.

This example illustrates in very simple terms how numerical tools may be introduced in a problem where no numbers are apparent. Our final model will show how geometrical tools may sometimes be useful in a problem that at first appears completely nongeometrical.

Model No. 4

The problem confronting us deals with the ranking of a set of objects. Suppose that ten experts are each asked to rank a set of 50 objects, in order of preference. To allow a maximum amount of freedom, we will allow ties in the rankings. We are then supposed to arrive at a consensus ranking. How are we to do this? This problem can be reduced to a problem analogous to classical statistics problems[4] if we are able to introduce a measure of distance between rankings. So our problem is that of taking the set of all possible rankings of 50 objects and of turning them into a geometrical space, one in which a definite distance is defined between any two rankings. I will here summarize the results of some as yet unpublished research.[5]

Let us agree on some notation. We will have in mind a fixed num-

ber of objects to be ranked. We will denote by capital letters, A, B, C, etc., possible rankings. For example, if we have three objects, a, b, and c, in mind, then A may be the ranking where b is first, a is second, and c is third; and B may be the ranking where c is first and a and b are tied for second place. We want to introduce a measure of distance between pairs A and B, which will be denoted by $d(A,B)$. Let us try to agree on certain conditions that such a definition must satisfy.

Condition 1. d must satisfy the conditions for a distance laid down by a geometer. That is:

(1) $d(A, B) \geq 0$, and equality holds if, and only if, A and B are the same ranking.

(2) $d(A, B) = d(B, A)$.

(3) $d(A, B) + d(B, C) \geq d(A, C)$, and the equality holds if, and only if, the ranking B is between A and C.

For the last part of condition 1, we need a definition of "betweenness." We will define betweenness in terms of pairwise judgments—that is, we will say that ranking B is *between* A and C if for each pair of objects, i and j, the judgment of B is between that of A and C. In other words, for the given pair the judgment of B either agrees with A or agrees with C, or A prefers i, C prefers j, and B declares them to be tied.

Next we must assure that our measure of distance does not in any way depend on the particular objects we have chosen for our rankings.

Condition 2. The definition of the distance d should not be affected by a relabeling of the set of objects to be ranked.

This means, for example, that if A rates three objects in the order a, b, c, and B rates them in the order c, b, a, the distance between these two rankings should be the same as the distance between the ranking b, c, a and a, c, b, since the latter may be obtained from the former by changing a to b, b to c, and c to a.

Condition 3. If the two rankings are in complete agreement at the beginning of the list and at the end of the list, and differ only as to the ranking of k objects in the middle, then this distance is the same as if these k objects were the only objects under consideration.

This condition is self-explanatory. Our final condition is in the nature of a convention. It may be thought of as choosing a unit of measurement.

Condition 4. The minimum positive distance is 1.

Let us suppose that we have agreed that these are four reasonable conditions for the definition of a distance between rankings. We have then translated our scientific problem into a purely mathematical problem. We can ask a mathematician three questions: (1) Is there any distance that will satisfy all of these conditions? Or, in

other words, are our conditions consistent? (2) How can we characterize all definitions that will satisfy these four conditions? (3) What additional assumptions can we make that would narrow the possible choice from many distances to one?

In this particular case we are confronted with a pleasant surprise, in that we find that our conditions are indeed consistent, and that there is one and only one possible definition of distance which will satisfy all of these conditions. Therefore, if we have agreed on the four conditions above, we must agree that this is *the* correct definition of a distance. The details of this proof are here omitted.

The resulting distance may be described as follows. Compare the rankings A and B for each pair of individuals i and j. If the two rankings agree, we write down 0. If one prefers i to j and the other j to i, we write down 2. And if one expresses a preference while the other indicates a tie, we write down 1. Once we have these numbers written down for all pairs i and j, $d(A, B)$ equals the sum of these numbers.

Had we written down this definition to start with, we might have thought it a fairly reasonable way to measure the distance between two rankings. However, had other equally reasonable-sounding definitions been suggested, we would have had no rational way of choosing among them. With our present procedure the argument is reduced to the four conditions stated above. Anyone who accepts those four conditions *must* accept the resulting definition of d. Hence, anyone who rejects our definition of a distance must specify which of our conditions he rejects, and should be forced to give conditions of his own which are reasonable and which lead to a unique choice of the distance function. In this way an argument about a sociological problem can be put on a useful plane.

As an illustration, we show in Figure 4 the possible rankings of three objects and the distances between these rankings. The notation used is such that $\left\{\begin{matrix} a \\ b\text{—}c \end{matrix}\right\}$ indicates that a is in first place, b and c are tied for second place. Distances between neighboring rankings are indicated in the figure. Thus, e.g., the (shortest) distance between $\left\{\begin{matrix} a \\ b \\ c \end{matrix}\right\}$ and $(a\text{-}b\text{-}c)$ is $1 + 2 = 3$.

If we now ask a number of experts to rank three objects, we may use Figure 4 to find the consensus ranking. This ranking may be

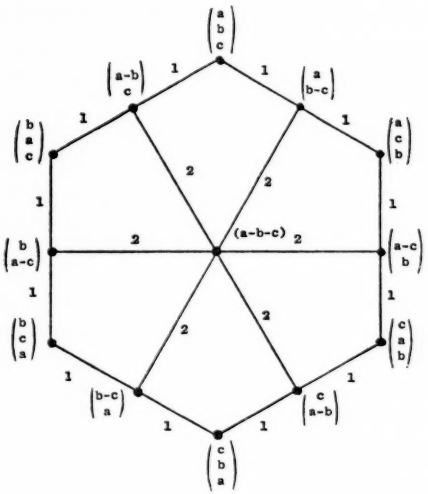

Figure 4

defined as the one such that the sum of its distances from the various experts' rankings should be a minimum. Alternatively, it is sometimes convenient to take the sum of the squares of the distances to be a minimum. This would mean, for example, that if we have three experts, two of whom hand in the ranking, *a, b, c,* and one the ranking *b, a, c,* then the method of minimizing the sums of the distances will give *a, b, c* as the consensus ranking, while the method of minimizing the sum of squares of distances will yield a tie between *a* and *b,* with *c* a definite third. On the other hand, if there is considerable disagreement among the three experts—if, for example, the first one rates *a, b, c* in that order; the second one *b, c, a;* and the third one *c, a, b*—then the method of minimizing the sums of the squares of the distances will tell us that the consensus ranking is a three-way tie. The method of minimizing the sums of the distances, on the other hand, will give us three possible consensus rankings, namely, the three rankings given by the individual judges.

It is an essential feature of either of these methods that it always yields us at least one possible consensus ranking; but, as illustrated above, it may yield us more than one consensus. These basic tools

enable one to carry out a certain amount of statistical work on rankings by experts.

An interesting question to consider is the relation between this definition of distance and the selection of consensus rankings on the one hand, and the work of K. J. Arrow on the other hand.

Arrow considered conditions that any reasonable system of social choice must satisfy.[6] His major result may be stated, in our terminology, as follows: *there is no method of selecting a consensus ranking from arbitrary sets of individual rankings that satisfies all his conditions.*

We have proposed two different ways of arriving at a consensus ranking, and hence we must ask how our methods escaped from the Arrow theorem. We find, first of all, that we have violated one of his basic conditions. This is the "condition of irrelevant alternatives," which has frequently been criticized. One consequence of this condition is the following: if we have three individuals ranking our objects, and if we know that two have ranked a ahead of b while the third has ranked b ahead of a, then we should be able to tell how a and b are ranked (relative to each other) by the consensus ranking. However, if we have two rankings $\left\{\begin{matrix} a \\ c \\ b \end{matrix}\right\}$ and one $\left\{\begin{matrix} b \\ a \\ c \end{matrix}\right\}$, our consensus ranking by either method will be $\left\{\begin{matrix} a \\ b\text{—}c \end{matrix}\right\}$. While if two individuals arrive at the ranking $\left\{\begin{matrix} a \\ b \\ c \end{matrix}\right\}$ and the third at $\left\{\begin{matrix} b \\ c \\ a \end{matrix}\right\}$, then the consensus will be $\left\{\begin{matrix} a\text{—}b \\ c \end{matrix}\right\}$. In the former case a is preferred to b by the consensus, while in the latter they are tied. When we examine these two situations on Figure 4, they appear exactly alike, and it is hard to see why anyone would disagree with the consensus rankings. This lends further evidence to the thesis that the condition of irrelevant alternatives should be rejected.

But there is a second and more basic way in which our methods differ from those investigated by Arrow, namely, that we occasionally arrive at multiple consensus rankings. We conclude that the requirement of a unique social ordering is too restrictive. It suffices that we should arrive at a unique ordering "in most cases."

Conclusion

The four models discussed above illustrate various ways in which mathematics may be useful in nonnumerical and nonspatial problems in the social sciences. They illustrate how both modern algebra and modern geometry provide new techniques for these fields, and they show that these techniques may apply in situations where numbers and space are never introduced or where numbers and space are more or less artificially introduced into nonmathematical problems.

Of particular importance is the method illustrated in the fourth model. Often social scientists may be in agreement on requirements for the solution of a certain problem, even when no agreement can be reached on an actual solution. In such cases a mathematician should be consulted. He may show them that it is impossible to meet all the requirements they have laid down, and in that case they would have to agree on ways of asking for less. Or, very likely, he may tell them that there are infinitely many ways of solving their problem, and give them some indication of the kind of additional requirements they could make on a solution. Finally, in an ideal situation such as the one illustrated in Model No. 4, he may be able to prove that there is a unique solution to the problem they have laid down. In this case he would solve, once and for all, a hitherto unresolved problem, and would provide the social scientist with a most useful tool for his work.

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Quality and Quantity in Quantum Physics

VICTOR F. WEISSKOPF

I

IN THIS ESSAY the antithesis Quality versus Quantity is understood to be related to the contrast between the specific and the unspecific, between individuality and continuous change, or between well-defined patterns and unordered flow. In this sense Quality and Quantity play a fundamental role in the basic concepts of quantum physics and in our scientific picture of the natural world. Of necessity our presentation of the role of this antithesis will be somewhat short and sketchy, and it can be justified only by the fact that not enough attempts are made by physicists to elucidate the basic ideas of the quantum theory, a field of human thought that, more than any other scientific achievement, has deepened and broadened our understanding of the world in which we live.

A case in point is the history of ideas on the structure of the planetary system. Let us consider three phases of this history: the ancient Pythagorean ideas; the modern ideas based on Newton's theory of gravity; and our present ideas regarding another planetary system—the system of electrons revolving round the atomic nucleus, the atom.

We are not interested here in the details of the Pythagorean system of heavenly bodies (e. g., the question as to which is the center and which moves in circles around the center), but in only one feature: the fundamental importance the Pythagoreans attributed to the numerical ratios of the radii of the orbits and to the numerical ratios of the periods of revolution of the different heavenly bodies. They considered the simple numerical relations between these data as the essence of their system. According to their ideas these relations were the embodiment of the "harmony of the spheres"; they represented the inherent symmetry of the heavenly world as contrasted to the earthly. The harmonious interplay of the various celestial

motions produced a music whose chords were audible to the intellectual ear and were a manifestation of the divine order of the universe. Thus not only the general structure of the solar system, but also the specific shapes and the actual periods of the orbits themselves were significant and uniquely predetermined. Any deviation would have disturbed the harmony of the spheres and therefore was unthinkable.

This picture of the solar system did not survive the development of a better understanding of the underlying facts. Isaac Newton recognized that the phenomenon of gravitational attraction was the guiding principle by which the motions of the planets would be fully understood. This discovery was the end product of a development that led to a complete change in the attitude toward the problem of planetary motion. Not only did it become obvious that the sun was the center of the system, but it was also recognized that the motions of the planets were governed by the same laws as governed terrestrial phenomena. For our purposes here, the following is important: the laws of gravity admit of many ways a planet might circle around the sun; it can be any orbit of elliptical shape. The specific orbits in which our planets actually are found cannot be determined by the fundamental law of motion, but by so-called "initial conditions," those prevailing when the system was being formed. In this sense the actual shapes are accidental. Slightly varying conditions at the beginning would have produced different orbits. We now have good reason to believe that there are many other solar systems among the stars whose planets have orbits quite different from those in our own system.

Here we have a characteristic trait of physical thinking up to the advent of quantum physics, a period generally referred to as that of "classical" physics. The fundamental laws determine only the general character of the phenomenon; they admit of a continuous variety of realizations. The phenomena actually realized depend upon influences acting before the phenomenon was allowed to develop without further interference from outside. For example, if another star swept close by our solar system, the planetary orbits would undergo a thorough change and would be quite different after the star had left; similarly, if another planetary system with a star like our sun and planets of the same masses as ours existed, it would be highly unlikely that its orbits would bear any resemblance to the orbits of our own system, except that the orbits also would be ellipses and that their

time of revolution would be the same function of the size of the ellipse.

It is typical of classical physics up to the turn of the century that its laws predetermine only the general character of the phenomena. The exact course of events can be predicted from the laws only if the situation at some past time is exactly known. The laws tell us only how an event develops; they do not tell us why we have this "solution of the equation" rather than another which would equally well fit the laws. This choice is considered accidental.

Since the time of Newton, classical physics has developed with the usual scientific crescendo and with ever increasing success, not only in mechanics but also by encompassing many different phenomena such as electricity and heat. The laws of nature discovered in this development were extremely successful in describing the character of many diverse phenomena. Hence these laws had to be a part of the real structure of the world around us. However, around the turn of the century it became obvious that the world of classical physics lacked some essential features to be found in the actual world. The stage was set for new discoveries.

II

To illustrate the situation at the beginning of quantum physics, let us return to a planetary system analogous to that of the sun and its planets—that of the atom. The properties of the solar system were exhaustively understood through the application of the laws of classical mechanics. The experiments of Rutherford and his contemporaries have shown that there exists another similar system, the system of electrons in the atom. It consists of electrons circling round an atomic nucleus, just as the planets revolve round the sun. The attractive force replacing gravity is the electric attraction between the negatively charged electrons and the positively charged nucleus. This force should produce the same type of motion in both cases, since it displays one important characteristic: it decreases as the reciprocal square of the distance.

The predictions on the basis of the atomic model were fulfilled in many respects. For example, the time of revolution of the electrons (which can be deduced from the frequency of the light emitted by the atoms) is just about what one would expect from the size of the orbits (as deduced from the atomic dimensions). However, the atom

has some very important properties one would never expect in a planetary system—the most striking, the *identity* of the atoms of a given material. One must be impressed by the fact that pure materials show identical properties, no matter where they come from or what their previous history has been. Two pieces of gold, mined at two different locations and treated in very different ways, cannot be distinguished from one another. All the properties of each individual gold atom are fixed and completely independent of its previous history.

The identity of individual atoms is strikingly not in keeping with what is expected from a mechanical system, particularly one like the planetary system. The particular shape and size of the orbits are expected to depend markedly upon the past history of the system; it would be extremely improbable to find two atoms with exactly the same size and shape. The difficulty becomes obvious when we consider a gas such as air: the atoms in air collide many million times per second. According to classical mechanics, each of these collisions would thoroughly change the orbits of the electrons. In fact, however, the atoms emerge completely restored to their original form after each collision.

The problem of definite shapes in atomic phenomena versus the arbitrarily changing forms in classical mechanics permeates atomic physics. We find definite "qualities" in the atomic world where we expected quantitative differences. The crystal structure of matter reveals well-defined simple geometrical patterns in the atomic structure that ought to be absent in classical mechanics. Nature exhibits all around us characteristic and specific properties of various materials, which, in spite of their overwhelming variety, are always reproducible and recurrent. The specificity of material qualities in nature is in need of a fundamental explanation.

Even the existence of elementary particles such as electrons, protons, neutrons needs some better understanding. These particles are the building stones of the atoms and must *a fortiori* exhibit complete identity among members of one kind if the atoms of a given type prove to be identical. Within the framework of classical physics it is hard to understand why there should not exist electrons with slightly less charge, or with a different mass, or with a spin (rotation about an axis) somewhat at variance with the spin of the observed electron. It is the existence of well-defined specific qualities, in which nature abounds, that runs counter to the spirit of classical physics.

In this connection one must mention the Boltzmann paradox, although the fundamental significance of this point might escape the nonphysicist. There seems to be no end to the following regression: matter consists of atoms; atoms of electrons and nuclei; nuclei of protons and neutrons; electrons, protons, and neutrons of . . . . Of itself, the existence of this regression should not worry us; it serves as a constant challenge to further research. However, in 1890 Boltzmann pointed out that on the basis of classical mechanics one is led to expect that for a system of atoms in thermal equilibrium at a given temperature, the thermal energy should be divided among all the modes of motion. This leads to a puzzle: all possible motions should share in the heat motion; in a piece of heated material the electrons should run around faster; the protons should vibrate more strongly within the nuclei; the parts of which the protons are made should move faster within their bounds; etc. Hence the above-mentioned regression would unavoidably lead to an infinite *sink* of heat energy, and it would need immense energies to heat the smallest part of matter. Here, as before, the classically admissible modes of motion are obviously too unspecific and too varied, and do not explain the structure of matter.

One main feature of classical physics is the divisibility of each process. Every physical process can be thought of as consisting of a succession of partial processes. Theoretically at least, each process can be followed step by step in time and space. The orbit of an electron round the nucleus may be thought of as a succession of small displacements. The electron of a given charge may be thought of as consisting of parts of a smaller charge. This is the point to be discarded if one wants to understand what we see in nature: quality, specificity, and individuality.

III

The great step forward that solved the paradoxes here outlined was achieved within only thirteen years, from the discovery of the quantum orbits of the atom by Bohr in 1913 to the final development of quantum mechanics by Bohr, Heisenberg, Schrödinger, and Dirac in 1926. The idea of the quantum of action, however, had already been conceived in 1900 by Max Planck. There is hardly any period in the history of science in which so much has been clarified by so few in so short a period.

The study of the properties of atoms has led to many indications

of new phenomena outside the scope of classical physics. The most striking is the particle and wave duality. In classical physics a beam of light and a beam of electrons are fundamentally different. The former is a bundle of electromagnetic waves propagating through space in a certain direction; no material is moving; only the state of the electromagnetic field in space is changing. In contrast, a beam of particles consists of actual matter in small units moving straight forward; it is as different as is the motion of waves on a lake from that of a school of fish swimming in the same direction. All the greater was the surprise of the physicists when electron beams were found to exhibit wave properties, and light beams to exhibit particle behavior.

The particle nature of light is revealed by the fact that the energy or the momentum of the beam is transferred to matter in finite amounts—the so-called light quanta. The size of the energy quanta is proportional to the frequency f; it has the value hf, where h is Planck's constant. The existence of the smallest package of energy hf turns out to be a general property of any vibrating process.

The wave nature of particle beams manifests itself in many ways. One is the well-known observation that particle beams show the same kind of "interference" as wave beams. A beam that penetrates a screen through two slits shows the characteristic intensity patterns, which are quite different from the simple sum of intensities expected of two separate beams emerging from the slits on the basis of the classical picture of particles. The pattern of intensity is in fact the same as if obtained from a wave passing through two slits. Another perhaps somewhat indirect manifestation is found in the atom itself. In many respects the electron orbits have shown a striking similarity to vibrating sound waves restricted within the confines of the atom. In fact, this aspect already provides some of the essential features missing in the classical picture. For example, a standing wave confined to a finite volume can assume only a certain restricted number of shapes, in particular when its frequency is supposed to be low, as it must be for the states of lowest energy according to Planck's law. These shapes are well defined and have a simple symmetrical structure, a fact known from other examples of standing waves, e.g., those in a violin string or in the air column of an organ pipe. They also have the property of "regeneration"; when a perturbing effect has changed the shape, they assume their original shape after the perturbation is over.

The main question now is: how can a particle in motion exhibit any wave nature? how is it possible that an electron is partly a particle and partly a wave? After all, a careful tracing of the electron along its motion must decide this question and put it in either one or the other category. Here we come to the question of the divisibility of atomic phenomena. Can we really perform this tracing? There are technical problems in the way. If we want to "look" at the detailed structure of the orbit, we must use light waves with a very small wave length. Such light, however, has a high frequency, hence a big energy quantum. When it hits the electron it will knock it out of the orbit and destroy the very object of our examination. These considerations are the basis of Heisenberg's uncertainty relations. They express the negative statement that certain physical measurements are impossible. Characteristically, just those measurements which would decide between the wave or the particle nature of the electron (or proton, or any other entity) are impossible. If one performs these measurements, the subject has thoroughly changed its state by the very act of performance.

Here we recognize the highly important fact that this impossibility of certain measurements is more than a mere technical limitation that some day might be overcome by clever instrumentation. If it were possible to perform such measurements, the coexistence of wave and particle properties in a single object would collapse, since these measurements would prove one of the two alternatives to be wrong. However, we know from a great wealth of observations that our objects exhibit both wave and particle properties. Hence the Heisenberg restrictions must have a deeper root: they are a necessary corollary to the dual nature of atomic objects. If they were broken, our interpretation of the wide field of atomic phenomena would be nothing but a web of errors and its amazing success would be based upon accidental coincidences.

Atomic phenomena present us with a much richer reality than we are accustomed to face in classical macroscopic physics. The response of the object to our experimentation displays features that do not occur with single objects in our macroscopic experience. Hence our description of the object cannot be as "detached" from the observing process as before. We can describe atomic reality only by telling truthfully what happens when we observe a phenomenon in different ways, although it seems incredible to the noninitiated that so many things should happen to one given object.

The wave nature of the electron in the atom is connected with the indivisibility, the wholeness, of the state of the atom. If we force a subdivision of the process and try to "see" more accurately where the electron "really" is within this wave, we find it there as a real particle, but we have destroyed the subtle individuality of the "quantum state." It is the wave nature, however, which gives rise to the characteristic properties of the quantum state—its simple shape, the regeneration of the original form after perturbation, in short, the specific qualities of the atom. The great discovery of quantum physics is the existence of these individual quantum states, each of which forms an indivisible whole, as long as they are not attacked by penetrating means of observation. Any attempt to observe subdivisions uses means of such high energy that they destroy the delicate structure of the quantum state.

The same situation exists also with the previously discussed electron beam which passes through a pair of slits in a screen and exhibits interference phenomena afterward. This phenomenon also has its individuality, its wholeness. When one tries to arrange a follow-up experiment in order to find out through which hole the electron went, the interference phenomenon is gone. The follow-up is too severe an operation, it destroys the wholeness of the quantum phenomenon.

At this stage of our discussion it will appear quite natural that predictions of atomic phenomena sometimes must remain probability predictions only. The prediction of the exact spot where the electron will be found after destroying a quantum state with high-energy light is a case of this kind. The quantum state is an individual entity which cannot be divided into parts without destroying it, although it spreads out over a finite region in space. If the quantum state is looked at with pin-pointing light, the electron will be found somewhere in the region of the wave, the exact point being undefined.

We now can return to the cause of identity among the same kind of atoms, and of their characteristic properties. The kind and shape of a standing electron wave is fixed and given when confined by the electric attraction of the nucleus, as is the shape of the vibration of a violin string. The standing wave of lowest frequency is spherically symmetrical, the next higher one has a "figure eight" symmetry; each step has its well-defined shape. These are the fundamental forms of which atomic structure is built. Even if we destroy an atom by removing an electron and later try to build it up again, the electron

will return to the same quantum state from which it previously had been removed. There exists only one unique state of lowest energy for each kind of atom. This is in complete contradistinction to the situation in a classical planetary system.

We are reminded of the Pythagorean "pre-established harmony": the atomic quantum states have specific shapes and frequencies which are uniquely predetermined. Every hydrogen atom in the world strikes the same chord of frequencies, as given by the Balmer formula of spectral terms. Here we find the "harmony of the spheres" rediscovered in the atomic world, but this time clearly understood as a vibration phenomenon of confined electron waves. The complete identity of two gold atoms comes from the fact that the same number of electrons are confined by the same electric charge in the center and therefore produce the same wave vibrations.

It is often said that the atomic world is less "real" than the visible world around us because of the fact that we cannot describe the atomic phenomena independently of the mode of observation, and because of the fact that one uses dual descriptions which cannot be visualized in any simple way or calculated without the use of abstract mathematics. Heisenberg says:

> The conception of the objective reality of the elementary particles has thus evaporated in a curious way, not into the fog of some new, obscure, or not yet understood reality concept, but into the transparent clarity of a mathematics that represents no longer the behavior of the elementary particles but rather our knowledge of this behavior.*

We do not agree with the claim that there is any lack of reality in the atomic world. After all, the visible real world consists of the same atoms that exhibit this strange behavior. It is true that the atomic world differs from our accustomed world more than anyone had expected; it has much richer patterns of phenomena than we can visualize with classical concepts. But all this does not make it less real. It is not very meaningful to distinguish between the actual behavior of the elementary particles and our knowledge of this behavior. It is precisely the ever growing insight into the detailed workings of nature which gives us confidence in having discovered something about the real world.

* Werner Heisenberg, "The Representation of Nature in Contemporary Physics," *Dædalus*, 87 (1958), 100.

IV

The individuality and the stability of the quantum states have definite limitations. The atom has a unique and specific shape only as long as it is not disturbed by outside effects strong enough for an excitation of higher quantum states. Under very energetic interference from outside, the individuality of the quantum effects disappears completely and the system acquires the classical continuous character (often referred to as the correspondence principle). Hence the quantum character of mechanical systems is limited; it is exhibited only as long as the disturbing factors are weaker than the excitation energy to higher quantum states. This excitation threshold depends on the character of the system. It is always higher, the smaller the spatial dimension of the system. For example, it needs very little energy to change the quantum state of a large molecule; it needs much more to change the quantum state of an atom; and it needs many thousand times more energy to produce a change within the atomic nucleus. We arrive at a characteristic sequence of conditions which we may call the "quantum ladder."

At very low temperature, the molecules of every substance form one big unit, a tightly bound crystal, in which one part is identical to any other. If we warm it to a higher temperature, melting or evaporation sets in and liquids or gases result. In a gas such as air at normal temperature, each molecule moves for itself in differing paths, bouncing against one another in irregular motion. The motions of the molecules are no longer alike; they are constantly changing, and they correspond to what we expect on the basis of classical mechanics. The molecules themselves, however, are still identical, one to the other. They interact as do inert billiard balls. The collision energies are not high enough to destroy their quantum state.

At still higher temperatures, the energy of collision surpasses the excitation energies of the molecules. The internal motion of the atoms and electrons participates in the exchange of energy. This is the temperature at which the gas begins to glow and emit light. If still more energy is supplied, the molecules split into atoms, and further on the electrons are torn off the atoms. Then the atoms lose their individuality and specificity. Electrons and atomic nuclei move freely and in random fashion; no two electrons move exactly alike. This state of affairs occurs at temperatures as high as exist in the interior of stars. It is possible, however, to create similar conditions in the

laboratory for a small number of atoms. At those energies the atomic nuclei are still in their ground states. They are still identical and specific, whereas the atoms are already reduced from their specific qualities to unspecific random behavior.* Only if the energies of millions of electron volts are fed into the system, as is done in our big particle accelerators, are the higher quantum states of the nucleus excited or the nucleus even disintegrated into its constituents, the protons and the neutrons. Once this is done, the nucleus also has lost its quality and its specific properties, and has become a classical gas of protons and neutrons.

The newest giant accelerators are about to pour so much energy into the protons and neutrons themselves that the latter will begin to show internal structure and differentiation, and thus lose their innate identity. This development may advance toward new and unknown structures if the energy is further increased—or it may stop at some point, without yielding any new particles. We do not know and probably will never know unless we try it out.

The quantum ladder has made it possible to discover step by step the structure of the natural world. When we investigate phenomena at atomic energies, we need not worry about the internal structure of the nuclei; and when we study the mechanics of gases at normal temperatures, we need not worry about the internal structure of the atoms. In the former case we can consider the nuclei as identical unchangeable units—that is, as elementary particles; in the latter case each atom may be considered as such. Thus the observed phenomena are simpler and they can be understood without any knowledge of the internal structure of the constituents as long as the prevailing energies are so low that the constituents can be considered as inert units.

The phenomenon of the quantum ladder also solves the Boltzmann paradox. The finer structure of matter does not participate in the exchange of energy until the average energy has reached the level of its quantum excitation. Hence only those types of motion whose quantum energies can be excited at the prevailing temperatures participate in the heat exchange.

* There is here a danger of confusion in our terminology: the word "quantum" is not related to what we understand by "quantity" versus quality. The term "quantum state" applies to the peculiar individual states of motion in atoms, molecules, or nuclei, which are the basis of the specificity and *quality* of these objects.

Let us now descend the quantum ladder, starting at the highest step known today. This may be a gas of protons, neutrons, and electrons at extremely high temperatures, with kinetic energies of many million electron volts. Not much individuality can be found under these conditions, except for the three elementary particles. Their motion is random and hence without any special order. At lower temperatures, say with kinetic energies of less than a million electron volts, the protons and neutrons assemble and form atomic nuclei. Much more specificity now enters into the picture. There are many possible atomic nuclei, the nuclei of the ninety-two elements and their isotopes, each a well-defined individual state. However, the motion of the electrons and the atomic nuclei is still at random, unordered, and continually changing. At still lower temperatures, corresponding to energies of a few volts only—this is the energy corresponding to the temperature of the surface of the sun (12,000 degrees F.)—electrons have fallen into regular quantum states around the atomic nuclei; this is the point on the quantum ladder at which the atoms with their specific individualities and chemical qualities appear. If we descend further, to the region of a tenth of an electron volt (about a few thousand degrees F.), we see that atoms can form simple molecules, and we find a much greater variety of chemical compounds, as distinct and specific as atoms, only somewhat less stable.

A further lowering of energy to a few hundredths of an electron volt (room temperature) brings us to a region where most molecules aggregate to liquids and crystals, thus adding to the diversity of matter. It is also the region in which giant chain molecules are formed. We have opened a completely new chapter of material specificity: living organisms. It starts with the formation of a great variety of chemical compounds of carbon with hydrogen, oxygen, and nitrogen—such as nucleic acids, amino acids, and proteins. The detailed dynamics of these giant molecules are not yet well understood, but some of their properties are well known. The most striking is the ability to include the formation of its replicas by combining simpler molecules into the pattern of the macromolecule itself.

The possibility of reproduction brings about a new mechanism: the structure most suited to reproduction, the one best protected against damage, will reproduce itself most abundantly. Hence we get a chain development of structures, the living organisms, which become consecutively better adapted according to the mechanism of

natural selection. The reproduction of living structures is determined and guided by certain large molecules, of which the most important is DNA (desoxyribo nucleic acid). The internal structure of DNA (in particular the order in which the purine and pyrimidine bases are arranged in it) is the determining factor for the properties of the units which are constantly reproduced in the cycle of life. Hence it is again the individuality of quantum states which is responsible for specificity in life. The specific structure of the nucleic-acid bases and the stability of the order in which they are arranged in DNA form another example, albeit a complicated one, of unique and identical quantum states. Because of the large size of the molecules, the number of possible quantum states is enormously greater than in the case of simple atoms or molecules, and their forms are much more intricate and complicated. This is reflected by the great variety of living species.

The existence of life requires that the temperature must be low enough to allow the formation of the macromolecules, but it also requires temperatures high enough for the supply of energy necessary for life processes. If we proceed downward on our quantum ladder to zero temperature, life decays, and all matter forms a big crystal in which many of the existing varieties are preserved but are frozen into inactivity. Everything is then found in its lowest state, a state of high specificity but without any change or motion. This is the stage of death.

Very probably the development of matter in the history of the universe has descended the quantum ladder just as we have described it, from high to low energies, adding new quality with each step. The history of the material world as we see it immediately around us probably began in some accumulation of protons, neutrons, and electrons of very high energy, compressed by forces of gravity, within a young star. This was a period of little differentiation. Later on, the elementary particles aggregated to atom nuclei, and in the colder regions of the star atoms were formed. This was the first step toward quality and organization. Individual properties began to appear, motion and radiation were no longer all uniform. Classes of identical objects were created—one could distinguish one thing from another.

On the surface of stars and the colder planets, the temperature further decreased, and conditions suitable for the formation of a great variety of chemical compounds were established. At that stage the world acquired an aspect not unknown to us, one of rocks, deserts,

and waters, abundant in minerals and chemicals but without any form of life. Finally, at certain places in the universe where conditions were favorable, the great adventure of nature took place of which we ourselves are a part. The organic macromolecules began their cycles of reproduction, and evolution toward the varied forms of life appeared. The development from quantity to quality then reached that stage of diversity and abundance which we know as the world in which we live. Human life, men's thought, and men's feelings are but one manifestation of this stage.

The contrast to the formless chaos of the beginning vividly illustrates the innate trend of matter toward distinction and specificity, a trend ultimately based upon the stability and individuality of quantum states. We who are living in the twentieth century are privileged to witness the most exciting phase of this development: the moment when nature in its human form begins to recognize a few of its own essential features.

The Quantification of Sensation

S. S. Stevens

Imagine that your finger is resting on the button of an electromagnetic vibrator and that a pair of earphones is clamped to your ears. Now you are asked to adjust the loudness in your ears by varying a gain control in order to make the sound from the earphones seem as strong as the vibration on your finger. Very probably you will say that this request makes no particular sense. In this type of experiment—the latest step in the century-old struggle to understand the dynamics of the sensory mechanisms—the observer often claims at the outset that, in "quality" at least, the sound cannot really match the vibration.

Nevertheless, once a person undertakes to make the two sensations as equal as possible in apparent strength—in "quantity" as it were—he finds it surprisingly easy to decide on a degree of loudness that seems to match a particular vibration on his finger; and when the stimulus on the finger is made more intense, he readily finds a matching loudness of appropriately increased magnitude. The orderly manner in which observers have performed the task of cross-modality matching has disclosed some beautifully simple laws of sensory action. The present account is concerned with these quantitative laws.

We employ the marvelous transducers known as sense organs in order to appraise the state of the environment and ascertain its objective condition. We see the turn in the road ahead, hear the spoken word, feel the coin in the pocket. Eyes and ears and fingers, like radio sets, are versatile sources of information which most of us enjoy with seldom a thought about their internal workings. Yet these sensory transducers, like radio sets, have specific input-output relations (operating characteristics), and the problem of their operation is quite as profound as any biological puzzle confronting us. No man-made device quite duplicates the eye with its acute sensitivity to faint light. In order to evoke a visual sensation, only a couple of quanta of light may be all that is needed at the retina. Along with this delicate threshold goes a capacity to respond to stimuli over a

dynamic range that is greater than a trillion to one. No less startling is the performance of the ear, an elaborate mechanical system that somehow manages to set off a sensation of hearing when the eardrum is moved by a sound wave through a displacement smaller than the diameter of the smallest molecule. Here too an incredible sensitivity is combined with an ability to respond without ill effect to a thunderous roar containing trillions of times the threshold energy.

So wide is the range of operation of the eye and the ear that we commonly resort to logarithmic scales to describe their respective stimuli. The familiar decibel scale is one such device. On this scale, a difference of 10 decibels represents a tenfold increase in energy; 20 decibels, a hundredfold increase, etc. If we choose as reference

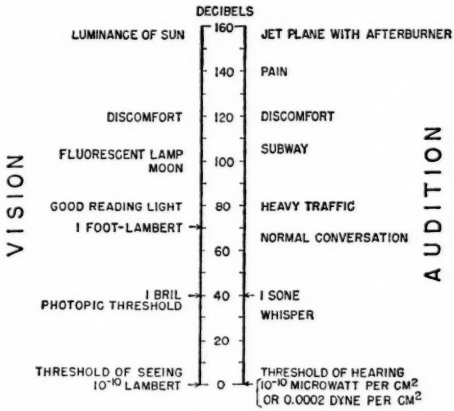

Figure 1

A decibel scale for light and sound, showing the approximate levels of luminance and sound intensity produced by various sources, together with a few important threshold levels. The points indicated by arrows are exact levels, fixed by definition; the other levels are approximate only. The *bril* and the *sone* are subjective units of brightness and loudness, respectively.

levels a pair of values a little below the respective thresholds, we can set up a common decibel scale for light and sound in such a way that interesting similarities between the two senses become at once apparent. As illustrated in Figure 1, the physical luminance of the

sun's disc stands about the same number of decibels above the human threshold as does the sound intensity near a jet airplane with an afterburner, which is probably the loudest sustained noise yet produced. Our sense organs can tolerate such levels of light and sound but briefly; these levels far exceed the point at which discomfort becomes pronounced, which for most people lies in the vicinity of 120 decibels. Curiously enough, the comfortable levels, both for seeing and for listening, lie near the middle of the decibel scale, and when stimuli grow fainter than about 40 decibels we strain to perceive them.

The decibel scale in Figure 1 stands for two physical scales, both contrived by operations familiar to the laboratory. The fact that two forms of energy (light and sound) can be scaled in such a way that similar sensory effects appear to emerge at related points along the common continuum suggests that, whatever the dependence of subjective brightness on physical luminance may be, a similar dependence must relate loudness to the energy of sound. An interesting conjecture, this—but is it true? How can the form of such a dependence be specified? Clearly, the rough tabulations on the chart in Figure 1 do not settle the matter, for at best they are merely suggestive. What is needed is some means of measuring the sensations involved.

Measurement

The eminent scholars who have said that sensation cannot be measured comprise a long and distinguished list. Some have asserted it flatly, as a truth too obvious for argument. Others have suggested reasons. The well-known claim of William James is perhaps the most quotable: "Our feeling of pink is surely not a portion of our feeling of scarlet; nor does the light of an electric arc seem to contain that of a tallow candle in itself."

That sentence was written some seventy years ago. The fact that sensations cannot be separated into component parts, or laid end to end like measuring sticks, was once a telling argument against their measurability. But that was before there was general recognition of the fact that measurement is not limited to counting. It was in fact before many scientists had become fully aware that mathematics with its number system is a game of signs and rules, man-made and arbitrary, like the game of chess. The formal emancipation of mathematics, its complete decoupling from matters of empirical,

earthy fact, was destined to fashion a new outlook on the problem of measurement.

Our understanding of the profound difference between science and mathematics took many centuries to develop, mainly because the operations of both measurement and mathematics had seemed at first to be one and the same process. The earliest scales of measurement were schemes for the counting of goods and chattels, pebbles and beads, friends and enemies. The numbers themselves, with their rules of combination and all the paraphernalia that grew into modern mathematics, originated as a simple model invented to mirror what was done with collections of objects, to aid in the measurement of numerosity. Since arithmetic was invented to serve the purposes of measurement, it is not surprising that the isomorphic correspondence between certain arithmetical operations and the more elementary empirical operations of counting was tight and satisfying. It was, in fact, too much so, for man soon found himself a slave to his invention: the properties of the model began to dictate what was and what was not to be considered measurement. But with the ultimate decoupling of the formal, arbitrary, empty, gamelike aspects of mathematics from the empirical pursuits of the "concrete" disciplines it became clear that the province of measurement extends to wherever our ingenuity can contrive systematic rules for pinning numbers on things.

The number system is merely a model, to be used in whatever way we please. It is a rich model, to be sure, and one or another aspect of its syntax can often be made to portray one or another property of objects or events. It is a useful convention, therefore, to define as measurement the assigning of numbers to objects or events in accordance with a systematic rule. Since there are different kinds of rules, there are different kinds of measurement; but for each kind some degree of isomorphism obtains between the empirical relations among objects and the formal relations among numbers.

Among the empirical properties of the world for which numbers may serve as models the most important are these:

(1) *Identity:* numbers may serve as names or labels to identify items or classes;

(2) *Order:* numbers may serve to reflect the rank order of items;

(3) *Intervals:* numbers may serve to reflect differences or distances among items;

(4) *Ratios:* numbers may serve to reflect ratios among items.

Table 1. A classification of scales of measurement. Measurement is the assignment of numbers to objects or events according to rule. The rules and the resulting kinds of scales are tabulated below. The basic operations needed to create a given scale are all those listed in the second column, down to and including the operation listed opposite the scale. The third column gives the mathematical transformations that leave the scale form invariant. Any number x on a scale can be replaced by another number x' where x' is the function of x listed in column 2. The fourth column lists, cumulatively downward, examples of statistics that show invariance under the transformations of column 3 (the mode, however, is invariant only for discrete variables). Reprinted, by permission, from Ref. 8.

Scale	Basic empirical operations	Mathematical group-structure	Permissible statistics (invariantive)	Typical examples
Nominal	Determination of equality	Permutation group $x' = f(x)$ where $f(x)$ means any one-to-one substitution	Number of cases Mode "Information" measures Contingency correlation	"Numbering" of football players Assignment of type or model numbers to classes
Ordinal	Determination of greater or less	Isotonic group $x' = f(x)$ where $f(x)$ means any increasing monotonic function	Median Percentiles Order correlation (type 0: interpreted as a test of order)	Hardness of minerals Grades of leather, lumber, wool, and so forth Intelligence-test raw scores
Interval	Determination of the equality of intervals or of differences	Linear or affine group $x' = ax + b$ $a > 0$	Mean Standard deviation Order correlation (type I: interpreted as r) Product moment (r)	Temperature (Fahrenheit and Celsius) Position on a line Calendar time Potential energy Intelligence-test "standard scores" (?)
Ratio	Determination of the equality of ratios	Similarity group $x' = cx$ $c > 0$	Geometric mean Harmonic mean Percent variation	Length, numerosity, density, work, time intervals, and so forth Temperature (Kelvin) Loudness (sones) Brightness (brils)

Corresponding to each of these uses there is a type of scale: nominal, ordinal, interval, and ratio, as set forth in Table 1, along with definitions and examples. The key to the nature of these different scales lies in a powerful but simple principle: the concept of invariance. When we have carried out a set of empirical operations (such as comparisons, matchings, balancings, orderings, etc.) we assign a set of numbers to reflect the outcome of the operations. Then comes the crucial question: in what ways can we transform the numbers without loss of empirical information?

As shown in Table 1, each of the four scales has its characteristic group of permissible transformations. For our present purposes, the group of greatest interest is the one that defines the ratio scale, for this is the most useful type of scale. Here we can only multiply by a constant, as we do in converting inches to centimeters, or seconds to minutes. Any more radical transformation would distort the picture that the ratio scale serves to portray.

The measurement of sensation on the most interesting type of scale would call, therefore, for a procedure for assigning numbers to sensations in such a way that anything more drastic than multiplication by a constant would cause a loss of information. Such a scale would be a ratio scale, and with it we could tell how sensory magnitude grows with the stimulus input. The numbers on this scale would allow us to specify, for example, when one sensation is twice as intense as another.

Sensation

Since each of us can testify that sounds may rise or fall in loudness and that lights may grow dim or bright, the problem of assessing the functions involved hardly seems forbidding. Nor need it be. Nevertheless, one can scarcely raise the question of measuring sensation without rousing a troop of old ghosts whose rustling and fluttering center chiefly around the issue of privacy. Ever since Descartes set mind apart from matter we have had to contend with the dualistic view that man's higher processes are a thing apart, inaccessible to science and measurement. However respectable quantification may prove to be in physical science, in psychology it still walks in the shadow of suspicion, for there lurks in many of us a feeling, not only that human experience is somehow inscrutable, but also that measurement, because of some unfeeling rigor, may bruise the human spirit if we go probing its inner reaches with the aid of scales and numbers.

Actually, however, in the study of sensation there need be no question of violating the privacy of immediate experience (whatever that may mean), because the sensation that science deals with is the type of human reaction that lends itself to public scrutiny. What is here meant by sensation is a construct, a conception built upon the objective operations of stimulation and reaction. We study the responses of organisms, not some nonphysical mental stuff that by definition defies objective test. Especially in the search for general sensory laws does it become obvious that the term "sensation" derives its meaning from the reactions, verbal or otherwise, made by organisms in response to stimuli. This operational principle, faithfully adhered to, seems the surest guide toward making quantitative order out of the reactions of sensory systems to the energetic configurations of the environment.

Quality versus Quantity

There is ready agreement among all observers that sensations come in so many and such varied forms as to elude complete description. All the richness of the daily sights and sounds and tastes and smells and feelings to which our sense organs admit us can no more be captured within a formula than can the intricate dancing of a falling leaf. Nevertheless, once a few basic distinctions are made, there emerge some simple and engaging principles that relate certain aspects of sensation to certain properties of the impinging forces of the environment. Perhaps the chief of these distinctions is the one between quantity and quality, or magnitude and kind, or size and sort. No pair of common words quite fits the distinction; but what it means concretely is that sweet is different from sour, although both may vary from strong to weak.

It is only fair to point out that psychophysics, the science of sensation, has little to say as yet about qualitative variations among sensations. This aspect of the sensory world confronts us with a succession of baffling and discontinuous leaps as we go from quality to quality, as well as from one sense modality to another—and no one quite knows why. The various colors, tastes, smells, and feelings seem not to lie on a continuum, but to exist in more or less complete independence of one another. In terms of the scales of measurement listed in Table 1, the sensory qualities provide a first-rate example of measurement at the nominal level—the most primitive type of

measurement, where all we can do is identify and label. Sometimes a crude ordering seems possible, but for the most part the qualities are just what they are, and the best we can do is to name them.

Quite different opportunities present themselves for those aspects of sensation that appear to lie on a continuum of some sort. Here we can usually order sensations on a scale from faint to intense, or on some other dimension, and for many continua a form of measurement stronger than ordinal may readily be achieved. It would of course simplify the problem if a common set of rules governed all perceptual continua, but this turns out not to be the case. At least one basic distinction must be made between two kinds of continua.

The prototypes of the two kinds of continua are exemplified by loudness and pitch. Loudness is an aspect of sound that has about it what can best be described as degrees of magnitude or quantity. Pitch does not. Pitch varies from high to low; it has a kind of position, and in a sense it is a qualitative continuum. Loudness may be called a *prothetic* continuum, and pitch a *metathetic* one. The criteria that define these two classes of continua reside wholly in how they behave in psychophysical experiments, but the names themselves are suggested by the nature of the physiological processes that appear to underlie each of them.

Sensory discrimination may be mediated by two processes: the one additive, the other substitutive. Additional excitation may be added to an excitation already present, or new excitation may be substituted for excitation that has been removed. An observer can tell, for example, when a light pressure becomes a strong pressure at a given point on the arm, and he can also tell when the stimulus is moved from that point to another location. Different sets of general laws govern these two types of sensory discrimination.

The metathetic, positional, qualitative continua seem to concern *what* and *where* as opposed to *how much*. They include such things as pitch, apparent position, apparent inclination, and apparent proportion. Perhaps they also include visual saturation and visual hue—at least to whatever extent hue may be made to behave as a continuum. All in all, the metathetic continua do not seem to comprise a neat and orderly class of perceptual variables, and as yet they have not been very thoroughly explored.

The prothetic continua, on the other hand, have lately yielded rich rewards for the systematic efforts made to scale their magnitudes. Some two dozen continua have been examined, always with the same

outcome: the sensation magnitude ψ grows as a power function of the stimulus magnitude ϕ. In terms of a formula,

$$\psi = k\phi^n$$

In this equation, the constant k depends on the units of measurement and is not very interesting; but the value of the exponent n may vary from one sensory continuum to another. As a matter of fact, perhaps the most interesting thing about a sensory continuum is (as we shall see) the value of the exponent n.

So rarely does it happen in psychological studies that a simple quantitative law can be shown to hold under many diverse circumstances, that the widespread invariance of the power law becomes a matter of significant interest. A law of this form seems to govern our reactions to light and sound, taste and smell, warmth and cold, vibration and shock—in fact, every continuum yet explored on which variations in intensity may be said to exist. As a general psychophysical law it provides a new aid to understanding and a new challenge to explanation.

Before we consider it further, a word is in order concerning the antecedent state of affairs.

The Older Psychophysics

G. T. Fechner, the father of psychophysics, had other ideas about the psychophysical law. Although he was aware of conjectures to the effect that the growth of sensation might be governed by a power law, he damned the notion from the start and fought stubbornly to the end for his famous and erroneous logarithmic law. So well did he contend, in fact, that for almost a century Fechner's logarithmic law ruled the textbooks and the thinking in psychology and physiology.

Fechner's law (beautifully simple though wholly wrong) will probably not be abandoned without a struggle on the part of many scientists. It is founded on the idea that sensation can be measured by counting its constituent units, thought by Fechner to be the just noticeable differences. The just noticeable difference between two stimuli—the resolving power, so to speak—usually turns out to be proportional to the stimulus magnitude itself. It follows from this, by an argument that need not detain us here, that the number of just noticeable differences (Fechner's scale of sensation) grows as the logarithm of the stimulus.

The Fechnerian attack on the problem of sensation was an assault from the rear, an indirect approach via resolving power, or least detectable differences. The idea that measurement must be reducible to counting still prevailed in Fechner's time, and the older psychophysics was looking for something to count. William James, of course, objected that a sensation is a unitary thing, not like a pile of blocks or a congeries of elements. Scarlet, as he said, is not a collection of pinks. True enough; but James should not have concluded therefrom that sensations have no magnitude.

The new psychophysics takes the stand that sensation is analogous to many other scientific constructs to which measurement is commonly applied. Consider temperature, for example. No one hopes to slice temperature into units that can be added or subtracted like measuring rods or counted like beans. We know the temperature of a body only through that body's behavior, which we note by studying the effects the body produces on other systems. It is much the same with sensation: the magnitude of an observer's sensation may be discovered by a systematic study of what the observer does in a controlled experiment in which he operates on other systems. He may, for instance, adjust the loudness in his ears to match the apparent intensity of various amplitudes of vibration on his finger tip and thereby tell us the relative rates of growth of loudness and vibration. Psychophysics at present is burgeoning with new and ingenious procedures for the implementation of such experiments. What follows below is by way of a progress report from midstream.

The Power Law

Perhaps the easiest way to elicit the relevant behavior from an observer is to stimulate his eye, say, with a variety of different intensities, and to ask him to assign a number proportional to the apparent magnitude of each brightness, as he sees it. Most observers, once they understand the problem, carry out this process (called magnitude estimation) with reasonable success. Not that all observers make the same estimates, or even feel any great confidence in what they are doing, but the average result for a group of normal observers turns out to be quite stable and reproducible. After all, it is the reaction of the typical (median) observer that interests us here, for we are not concerned, at the outset at least, with the fact that people differ, or that some are blind and some are photophobic. Psycho-

physics wants to know, first of all, what the typical input-output operating characteristics of the sensory systems are.

The typical input-output relation for all prothetic continua thus far tested is a power function. To date, the observed values of the exponent in the relation $\psi = k\phi^n$ have ranged from about 0.33 for brightness to about 3.5 for the apparent intensity of electric shock applied to the fingers. The exponent of the power function determines its curvature. If the exponent is exactly 1, the function is a straight line, and the output (reported sensation) varies linearly with the intensity of the stimulus. But when the exponent is greater than 1, the line representing the function ascends in an ever steeper slope. When it is less than 1, the curvature is the other way and the line becomes ever more horizontal.

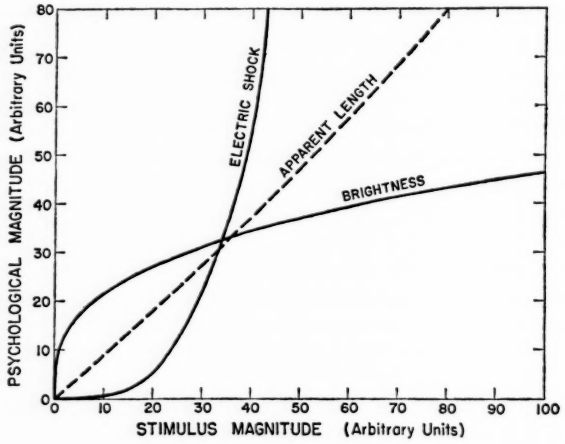

Figure 2

The apparent magnitudes of shock, length, and brightness follow different curves of growth. Their exponents are 3.5, 1.1, and 0.33, respectively. The units of the scales have been chosen arbitrarily in order to show the relative form of the curves on a single plot.

These relations are illustrated in Figure 2, which shows examples of three perceptual continua, each having a different exponent. Electric current produces a sensation whose intensity grows more and more rapidly as the current increases, whereas brightness seems to

grow less and less rapidly with increasing physical intensity. As we might expect, the apparent length of a line seems to grow very nearly in direct proportion to the physical length. One foot looks about half as long as two feet—not quite, it seems, but almost.

A felicitous feature of power functions is the form they assume when graphed in log-log coordinates (logarithmic scales on both axes). The plot of a power function then becomes a straight line, and the slope of the line is a direct measure of the exponent. We can see how this works out if we make a log-log plot of the same three functions shown in Figure 2. We find that the differences in curvature in Figure 2 become differences in slope in Figure 3.

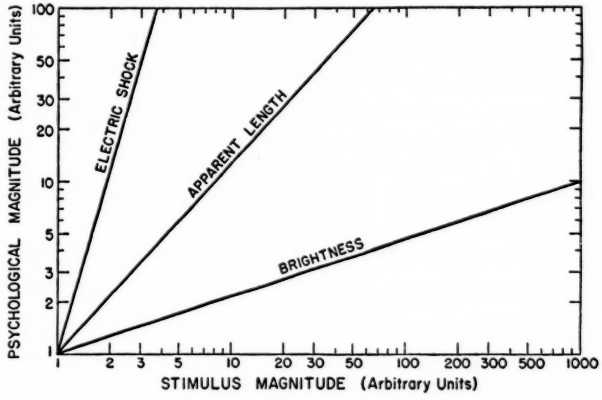

Figure 3

When the curves in Figure 2 are plotted against logarithmic coordinates, they become straight lines. The slope of the line corresponds to the exponent of the power function that governs the growth of the sensation.

The nature of these power functions and the universality of their application testify to the existence of a profoundly simple relation between stimulus and sensory response: equal stimulus ratios produce equal subjective ratios. That is the essence of the psychophysical law. For example, it requires approximately a ninefold increase in energy to double the apparent brightness of a light, no matter where we start from in the first place. Doubling the apparent intensity of an electric shock requires an increase in current of only about

20 per cent, but this percentage increase is approximately the same all up and down the scale. On all continua governed by the power law, a constant percentage change in the stimulus produces a constant percentage change in the sensed effect.

Cross-Modality Validation

The curves in Figure 3, and many like them, were determined by asking observers to undertake, by one procedure or another, what amounted to a numerical estimation of relative sensory intensity. A scientist is properly uneasy about procedures that seem to rely on a mere expression of opinion and that seem also to depend on a fairly sophisticated acquaintance with the number system. (Naïveté about numbers is indeed an occasional source of trouble with some observers!) But the question of greatest consequence really concerns the issue of validation: can we confirm the power law without asking observers for numerical estimations, and can we verify the predictions implicit in the type of functions plotted in Figure 3?

The nature of these predictions can most easily be expressed in terms of the lines in the log-log plots. If two sensations, loudness and

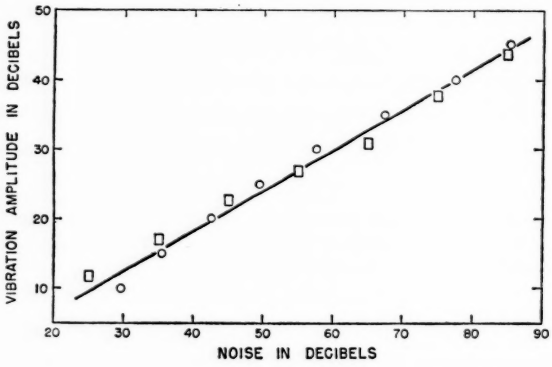

Figure 4

An equal-sensation function relating vibration (60 cycles per second) on the finger tip and the loudness of a band of noise. In one experiment the observers adjusted the loudness to match the vibration (circles); in the other they adjusted the vibration to match the loudness (squares). The stimulus values are measured in terms of logarithmic scales (decibels).

vibration, grow by different exponents (slopes), then an experiment in which the observer matches loudness to vibrations for equal apparent strength should produce a matching function that is a straight line in log-log (or decibel) coordinates. Moreover, the slope of the line should be predictable from the two original slopes, and should, in fact, be the ratio between these slopes.

A recent experiment of this kind gave a close approximation to the predicted results. Ten observers matched loudness (which had been found to grow as the 0.6 power of the sound pressure) to vibration (which grows as the 0.95 power of the amplitude), and produced a function whose slope was approximately 0.6, i.e., the ratio of 0.6 to 0.95. Figure 4 shows a plot of the data.

The success of this experiment and several similar ventures led to a bolder undertaking. If cross-modality matches can be made

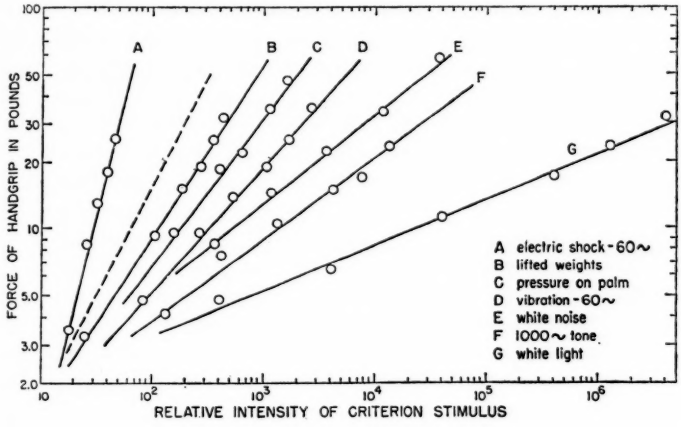

Figure 5

Growth of sensation on seven perceptual continua as measured by force of handgrip. For each value of each criterion stimulus, the observer exerted a force on a hand dynamometer in order to indicate the apparent intensity of the stimulation. Each point represents the median result for a group of ten or more observers. The relative positioning of each function along the abscissa is arbitrary. The dashed line shows a slope of 1.0 in these coordinates. Note that the lines for loudness (lines E and F) are plotted as though the abscissa represented sound pressure. If plotted against sound energy, the slopes would be similar to that for brightness (line G).

so easily, why not stimulate the observer through a sense organ and allow him to produce a matching sensory magnitude—apparent force, for example—by simply squeezing a hand dynamometer? By exerting force on a precision dynamometer, an observer can produce a sensation of strain, and at the same time activate a dial indicating the physical force exerted. In effect, then, the observer is asked to report the apparent magnitude of brightness, loudness, electric shocks, etc., by emitting appropriate squeezes instead of numerical estimates.

The actual data for seven different prothetic continua, which the observers tried to match by squeezing, are shown in Figure 5. Two features of this plot are especially interesting. All the functions approximate straight lines, precisely as the power law predicts they should, and the slopes vary from steep to flat in the manner expected. The function for electric shock rises most abruptly, proving that its exponent is large, while the function for brightness grows relatively slowly, as other evidence predicts it should.

So far so good, but a vital question remains. In order to complete the circle of validation and to exhibit all the compelling consistency that might be hoped for, we must ask whether the actual numerical values of the slopes in Figure 5 can be correctly foretold.

First, however, we must ask what happens when observers make numerical estimations of the apparent intensity or subjective force of their squeezes. In a careful and thorough experiment, my colleagues J. C. Stevens and J. D. Mack found that the apparent force of handgrip grows as the 1.7 power of the physical force applied. With this factor available, we are equipped to pose the decisive question: if the slopes in Figure 5 are multiplied by the factor 1.7, do they then equal the respective values of the slopes obtained by the method of magnitude estimation? It turns out that, within reasonably close limits, they do.

Despite the variability of human reaction, despite the relatively low precision with which a given sensory effect can be gauged, and despite the inevitable fact of individual difference, it grows increasingly clear that there is a simple and pervasive law that controls the over-all dynamics of sensory intensity. Encouraging and interesting as this may be, science of course cannot be expected to rest content without deeper understanding. Why the power law? Is this a form that is dictated, as R. D. Luce has suggested, by a kind of mathematical necessity? And what about the physiological mechanisms involved—can we look to them for further explanation of the psycho-

physical functions? As always happens, the discovery of a general principle susceptible of confirmation by experimental test has the effect of generating a goading sequence of new challenges. There can never be an end to this spiral in scientific work.

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The Problem of Quality and Quantity in Economics

WASSILY LEONTIEF

I

THE DIALECTIC juxtaposition of quality and quantity, of uniqueness and repetition, of abstract theory and of concrete description, has from far back been the *leitmotiv* of the running methodological controversy in social science. The nineteenth-century Continental, particularly the German, philosophic tradition supplied the general background for the first stages of this discussion. In economics the issue was originally raised in the full-dress attack mounted in the third quarter of the last century by the so-called German historical school against the then dominant classical theory. It is not surprising that such antitheoretical orientation found no prominent adherents among economists in England, although among the English historians it was quite recently most eloquently espoused by so prominent a scholar as Collingwood.

The emphasis on the singular as against the common, on the organic as against the mechanical, found on the other hand a receptive soil for its development in the economic thought of the United States. Both Thorstein Veblen and Wesley Mitchell, two of the most eminent representatives of indigenous American economic thought, carried on the *Methodenstreit* against quantitative, analytical economics in the grand style of the German historical school. The fact that at the turn of the century the German academic influence in the United States was as strong as and possibly even stronger than the English might be in part responsible for this. In discussing the issue of quality *vs.* quantity, one must keep in mind that it represents only one facet, one stage, of the wider contest between the proponents of concise analytical methods and the defenders of the descriptive individualizing approach.

Among the social sciences, economics came to be considered—and

rightly so—a quantitative science par excellence. Quantification in this instance is more than a methodological device employed by the investigator: it is also an object of the inquiry itself. The modern *Homo economicus* may not be the much maligned predatory hedonist, but he certainly is a consciously calculating animal. It is only natural that in explaining his behavior the economist resorts to mathematics, too. However, lest one draw from this the erroneous conclusion that quantitative analysis is restricted to only those aspects of the economic process which involve directly observed, consciously (or rather self-consciously) quantifying attitudes, let me emphatically state that this is not the case. Some of the most advanced applications of mathematical methods in economics are found in the fields of general equilibrium analysis and business-cycle theory—both recognized as quasi-mechanical, automatic phenomena formed and operating to a large extent beyond the calculations, outside the control of, and mostly against the wills of, the millions of individuals whom they affect.

II

The raw materials from which the economist forms his theory—or if one prefers a more fashionable term, from which he constructs his analytical models—are the millions of various combinations in which specific goods and services are made and used within the economic system he observes. The principal elementary building blocks which he makes up out of his materials are the "production function" and the "utility" or the "consumption function." These he then uses to explain certain manifestations in the behavior of individuals, or of groups of individuals; that is—if one again prefers to use esoteric language—to explain the decisions being taken by the "players" in the vast economic "game."

A "production function" is a description of the quantitative relationship between the inputs absorbed and the outputs emerging from a particular production process. A baking receipt stating that it takes two pounds of flour, two cups of milk, two eggs, and a quarter of a pound of butter to make two loaves of bread is a typical production function; so is the concise listing of all the various combinations of ore, coke, auxiliary materials, and the labor required to produce various amounts of pig iron.

Let x_1, for example, represent the number of tons of ore, x_2 the number of tons of coke, and x_3, the man-hours of labor used to make

y tons of pig iron. The corresponding quantitative input-output relationship can be concisely described by an equation of the form:

$$y = f(x_1, x_2, x_3) \tag{1}$$

the specific shape of the function $f(x_1, x_2, x_3)$ being determined by the given state of technology. The identification of all the variables involved and the definition of the units in which each one of them is measured represent the qualitative side of this concise description of the economically relevant aspects of the ironmaking process; without these specifications the mathematical formula has no empirical meaning.

The production function—with the appropriate identification of variables involved—can be viewed as a relationship derived from a much larger, and qualitatively much richer, set of far more complete descriptions of all the known methods of making iron, or—as the case may be—baking bread. Such a description would for example dwell in full detail on the role played by the temperature maintained in the blast furnace, and the pressure and the oxygen content of air supplied to its top or base. A complete technological production function would thus contain in the parentheses enclosing the predicate of f many such additional variables not included in its abbreviated version used in equation (1). The economist eliminates them and thus reduces the qualitative complexity (the dimensionality) of the material with which he will have to deal from then on. He retains only those variables the magnitudes of which affect *directly* either the costs incurred in, or the revenue received from, the operation of the production process he describes. Since ore, coke, and labor, as well as pig iron itself, have positive prices, the change in the magnitude of any one of these variables will directly affect the costs incurred in (or the revenue received from) the ironmaking process. Thus, if any one of these variables were omitted from the production function, the economist would be unable to identify the profit-maximizing input-output combination which he assumes will be in fact maintained by the producer whose actions he sets out to explain.

It is of course true that variations in the amount of air supplied under pressure to the furnace, or changes in its internal operating temperature, would affect the efficiency and consequently the profitability of the entire process as well. Such "non-priced" variables, however, exert their influence on costs or revenue only indirectly, through modifying the quantitative relationships between the

"priced" factors: a change in the supply of air or in the furnace temperature would, for example, increase or decrease the pig-iron yield obtained from given fixed amounts of ore, coke, and labor, or affect the amount of coke required to produce a fixed amount of pig iron with given quantities of ore and labor. As a matter of fact, the profit-maximizing producer can be expected to adjust the magnitudes of all the non-priced variables in such a way as to attain an efficient relationship between the quantities of the priced variables. On the assumption that he actually does so, the economist proceeds to explain the producer's action in terms of a reduced production function, i.e., a production function which describes not all the possible combinations of all the technologically relevant variables, but only certain preselected efficient relationships between the priced variables.

It is worth noting that no irreparable damage is caused if, by oversight or for some other reason, the economist's condensed production function did contain some of the extra technological variables. It could still be used to explain correctly the producer's profit-maximizing behavior; except that the explanation (i.e, the calculations) would have to be carried out in a larger number of dimensions than is absolutely necessary.

III

Another simpler and fundamentally much more general device which the economist uses to reduce the number of qualitative distinctions required for the explanation of observed facts is the method of formal substitution.

Let us enlarge the scope of the previous example by including in it the ore-mining and the coke-making sectors of the economy along with the blast-furnace industry itself. This can be done by setting up two additional production functions. In the description of mining operations, the variable x_1 representing (as it did before) the quantity of ore will appear on the left-hand side of the equation as the output; on its right-hand side, under the function sign ϕ—representing the appropriate reduced technical relationship—this equation will contain new input variables: say, z_1 = the tonnage or the cubic yards of ore bearing deposits, z_2 = the number of kilowatt hours of electric power, and z_3 = man-years of miners' work:

$$x_1 = \phi\,(z_1, z_2, z_3) \tag{2}$$

Similarly, another equation describing the production of coke

shows its quantity, x_2, as related to the quantities of the inputs, coal, v_1, and labor, v_2:

$$x_2 = \theta\ (v_1, v_2) \tag{3}$$

In widening the scope of the inquiry, we have thus introduced five new qualitatively distinct variables and two additional functional relationships. But having made this step forward, we can now take a half-step back. Let us substitute for the variables x_1 and x_2 as they appear on the right-hand side of equation (1) their production functions presented in equations (2) and (3). Thus we obtain a new, enlarged production function for pig iron:

$$y = f\ [\phi\ (z_1, z_2, z_3), \theta\ (v_1, v_2), x_3] \tag{4}$$

This function is more comprehensive than the first insofar as it reaches back behind the iron-smelting process and covers two other sectors of the economy, one engaged in the mining of ore (x_1), and the other in the making of coke (x_2). These two variables are, however, not entered explicitly on the right-hand side of the enlarged equation. Instead, that side shows the inputs used by the ore-mining and coke-making industries, respectively. Of the nine variables appearing in the first three equations, the two mentioned above have been eliminated in the last, without making our analysis less concise. The purpose of this example is to show that the formal operation of algebraic substitution, when used in analysis of real (i.e., observable) phenomena, permits us to describe them with fewer qualitative terms.

IV

Turning to the "utility function," we again meet the substitution method—but used in reverse. In analyzing the behavior of consumers, the economist assigns to this function a role similar to that which he gives to the production function in the description and explanation of the behavior of producers. The inputs consist now, not of ore and coke, but of such consumers' goods as bread and shoes; the output is not pig iron but utility. But what is utility, how can it be measured, does it exist at all? Strangely enough, the economists began to ask themselves these questions only relatively recently. Before that, they spoke of satisfaction or utility as if it were an object with as distinct, immediately observable qualities as steel or bread. However, as soon as the pedantic Edgeworth and the skeptical Pareto expressed

their doubts on that score, a lively, not to say violent, discussion ensued which has not subsided yet. Some theorists maintain that utility exists and can indeed be measured like steel or bread, although the yardsticks applied to different persons and the resulting measurements can in no way be compared with one another. Others deny the possibility of any such cardinal measurement, even for a single person; they assert that the amounts of utility from which an individual has opportunity to choose can be compared with one another only ordinally: as in the case of pain, one does not know how much one has of it, but only feels that it is becoming more or less intense. Finally, there are theorists who do not care whether utility exists and is measurable or not. They say that the behavior of a consumer (for example, the change in the quantities of various goods he buys and in the amount of work he will do to earn the income with which to pay for them) can be explained without recourse to a variable called utility.

There is an obvious analogy between the problem of the existence or nonexistence of utility and of its explanatory use, and the question of whether one can or should substitute the intermediate variables, x_1 and x_2, which came up before when we discussed the problem of compounding the interrelated production functions for pig iron, ore, and coke. Imagine a situation in which the inputs and outputs accessible to direct observation by the economist are only those described by the variables shown in the compound production function (4). This means that his empirical data permit him to establish a valid quantitative relationship between the amounts of ore-bearing land (z_1), electric power (z_2), and labor (z_3) absorbed in mining operations; the quantities of coal (v_1) and labor (v_2) used for making coke; and the amount of blast-furnace-tending labor (x_3) on the one hand: and on the other the quantity of pig iron (y) emerging at the end of the entire combined operation. This information will obviously permit him to construct and use for further analytical purposes the integrated over-all production equation (4); such factual information, however, will not be sufficient to enable our economist to reconstruct each one of its component parts, i.e., the three production functions describing separately the pig-iron-smelting process and the processes of mining ore and of making coke. Neither his immediate empirical evidence nor his theoretical model will contain any reference whatsoever to either the qualities or quantities of such objects as ore or coke.

This could not, however, prevent our investigator from embarking on what will appear to be an arbitrary theoretical construction of the three interrelated intermediate functions containing two new "artificial" variables, x_1 and x_2. Not only their dimensions (i.e., their qualitative properties) but even their very existence would obviously depend in this case only on circumstantial evidence combined with certain essentially arbitrary a priori assumptions. The analytical purpose of introducing these two additional variables would be to provide a means of breaking down one complicated quantitative relationship into three simpler ones. If numerical manipulations are involved, a theoretical reformulation of this kind often leads to considerable simplification of the computational procedure.

Returning to the problem of the existence (if one assumes that it does exist) of alternative measures of utility, we can now see by analogy that it is essentially a question of introduction or omission of an auxiliary variable and of a corresponding reformulation of a given system of theoretical relationships.

V

The delicate interplay between direct observation and analytical construction has been dramatically illuminated by the following curious incident from the recent history of economic thought. Twenty years ago a prominent Soviet Russian mathematician, Professor L. V. Kantorovich, published a paper in which he developed a new approach to production planning. The problem he set out to solve was essentially one of choosing among several technologically possible methods of producing a given goods that which would maximize its output. In particular he considered cases in which each one of the available alternative methods could be described as a specific combination of the amounts of various factors required to produce a unit of the finished goods and in which the total available quantities of all factors were fixed. In our previous example, one method would, for instance, require a ton of ore, three tons of coke, and two man-hours of labor for every ton of pig iron; another, one and a quarter tons of ore, but only two and a half tons of coke and one and three-quarters man-hours of labor; and so on. Given a total supply, say, of six hundred thousand tons of ore, fifteen thousand tons of coke, and eleven thousand man-hours, what method or what combination

of methods would enable us to produce the largest possible amount of pig iron? This was Kantorovich's question.

He found that the calculation of a correct answer—if the number of distinct possible input combinations and the number of inputs involved is fairly large—is greatly facilitated if one introduces certain auxiliary variables which he called "allocation coefficients," represented in his theoretical formulae by the symbols $\lambda_1, \lambda_2, \ldots \lambda_n$.

At the time of publication, Kantorovich's paper apparently found little response among Russian economists and none among the practical planners. It did not reach the West when published in 1939; the hot war and the subsequent cold war intervened, so that Western economists had the opportunity of acquainting themselves with its contents only a short time ago. They were surprised to find that Kantorovich's "allocation coefficients" were actually the prices of the individual goods and services, which appeared as inputs in his production functions. That is, the quantitative relationship established by Kantorovich between these λ_i's on the one hand and the shapes of his production functions and the given total amounts of the various inputs on the other, was exactly the same as is used in Western economic theory to explain the determination of factor prices in a competitive economy.

This theory in its modern version views the entire national economy as a kind of gigantic computor. Propelled by the profit-maximization motive and other similar forces, it automatically solves the problem of the efficient allocation of all available resources. The computational technique which this natural machine employs to arrive at correct answers is the so-called iterative procedure, i.e., the method of step-by-step approximation through trial and error.

For Western economists, prices are elements of the observed reality, as real as are the tangible physical properties of various goods. The objects of Kantorovich's analysis were only these physical quantities and the technical relations between them. There is good reason to believe that in the context of the planning problem which he intended to solve, the actual existence of observable prices was not taken into account by him at all. Facing a well-defined empirical problem, he was led by the internal logic of the theoretical argument, combined with considerations of computational convenience, to the artificial construction of peculiar measurable qualities which under somewhat different conditions actually happen to exist. The Western

theory of linear programing, which Kantorovich's original contribution has anticipated in part, uses the term "shadow prices." The relationship between observed and constructed qualities and quantities in modern science, indeed, reminds one of a Pirandello play.

VI

The conceptual apparatus of modern economics described above has a rather fragile but at the same time precisely balanced structure. It contains variables which represent directly observed facts; by this I mean facts were more often observed by someone else rather than the economist himself, and were usually described in ordinary, everyday language or in the technical language, not of economics, but of some other discipline. These variables make up the cutting edge of the analytical tool without which it could have no operational significance. As we have seen, this tool also contains in its inner works auxiliary concepts of a rather artificial kind. Both qualitatively and quantitatively the two types of variables are mutually aligned, like gears in a well-made clock. This does not mean that the qualitative characteristics of the artificial variables are similar to those of the variables belonging to the more realistic group. On the contrary, it is precisely their different qualitative make-up on which the effective analytic combination of the two kinds of variables depends.

The introductory paragraphs of this essay contained a reference to Wesley Mitchell as representative of a major antitheoretical trend in American economic thought. While criticizing the erection of elaborate theoretical models, he proposed to rely on direct observation not based on any preconceived notions, and in particular advocated massive measurement of the observed facts. To Mitchell, to his pupils, and to his successors, this country owes the large-scale development of descriptive economic statistics without which not only modern economics but many of the modern economic institutions could not possibly exist.

While they are suspicious of theoretical speculation, the proponents of this self-professed positivistic approach nevertheless make up new scientific concepts or at least adopt some of those already in use. Typical examples are the regularly published figures of the "U.S. national income," of the "U.S. output of consumers' goods," and the "price level of agricultural products." None of these terms refers to a concrete object familiar to the direct participants in daily prac-

tical economic transactions. Each one refers, however, to a group of such objects defined in a rather simple, not to say simple-minded, way. The "output of consumers' goods" is obviously meant to be the combined total of the measured outputs of bread, shoes, men's suits, TV sets, and so on; the "average price level of agricultural products," the average price of wheat, cotton, oranges, meat, etc. The objects in each such group have some property in common—that of being used by consumers or being prices of all products of agricultural enterprise—but they differ from one another in many of their qualities, too. In no case does there exist a common unit which can be unambiguously used to measure the magnitude of all the individual members of each group before one proceeds to sum them up or to average them out. The operation of determining the magnitude of such artificial aggregative objects—the economic statistician calls them index numbers—involves, in other words, adding pounds or tons of steel and yards or meters of cloth. The final result thus necessarily depends on the arbitrary choice of units in which one measures the magnitude of each one of the component parts.

If one speaks of the "output of consumers' goods" instead of the outputs of bread, shoes, and books, or of the "price of agricultural commodities" instead of the price of wheat, the entire economic system can indeed be described in fewer words. However, the reduction in qualitative variety is attained at the cost of ever increasing quantitative indeterminacy; as we have seen, the more general the contents of an index number, the more vague and arbitrary will its measure be. This puts strict upper limits on the effectiveness of verbal generalization—and on that of the corresponding quantitative procedure of averaging or of aggregating—as a tool of economic research. On the lower levels of scientific inquiry its use of course cannot possibly be avoided. When one speaks in general of "appliances" instead of "consumers' durables," one excludes automobiles but leaves unspecified whether one has in mind refrigerators, washing machines, or TV sets; and when one speaks of refrigerators, one still omits the distinction between those run by electricity and those operated by gas. Only an ideal theoretical system could take in all observable distinctions and explain them to the last detail. At any given stage of its development, economic analysis—like theoretical analysis in any other empirical discipline—can operate effectively on a certain level of qualitative differentiation, but not further down. However, the cutoff point below which the economist has to ignore

qualitative distinctions (since he cannot explain them) can be expected to shift downward.

Both the theoretical analyst and the antitheoretical empiricist must rely on crude verbal generalization as the only means they can begin with to reduce to manageable proportions the seemingly unfathomable variety of the immediately observed facts. The difference between the two shows up in what they do next. The theorist sets out to develop generalizations of a more complex and systematic kind, with which he expects first of all to master the obvious qualitative distinctions preserved at the first descriptive stage. He furthermore proceeds to recover and to incorporate into his analytical system successive layers of finer differences which were neglected or suppressed in the original verbal purge.

The empiricist, to the extent to which he wants to generalize at all, prefers to follow the first verbal step with a second, third, and so on. The entire sequence involves thus nothing more than omitting details, averaging, and aggregating. In following this apparently simple and safe procedure, the opponent of theoretical speculation soon finds himself facing unexpectedly the highly speculative and—what is worse—essentially unsolvable problems of so-called index-number theory. He winds up either with a system of quantitatively well-defined relationships between qualitatively ill-defined variables or with a set of quantitatively indeterminate—or at least loosely described—relationships between sharply defined variables.

The process of the gradual deepening and expansion of economic inquiry naturally brings it into closer contact with adjoining fields. Modern economics has established with technical-engineering disciplines a close cooperative relationship based on an effective division of labor. However, its borders with other social sciences are still very little explored, and its relations with them are marked not so much by active cooperation as by jurisdictional disputes in which each side raises claims on some outlying territories which with their present analytical resources neither can in fact occupy or hold. Two fields of scientific inquiry can be interconnected effectively only through a clear conceptual overlap. Moreover, the overlapping (that is, the common) concepts must have proven their internal operational effectiveness separately in each one of the adjoining disciplines. If these basic conditions are not satisfied, interdisciplinary committees and interdisciplinary negotiation can yield no more than an exchange of reciprocal propaganda claims.

The Qualitative and the Quantitative in Political and Legal Analysis

HAROLD D. LASSWELL

THE PROBLEMS that cluster about quality-quantity relationships in political and legal analysis have to do with (1) the formulation of theory, (2) the procedures of data-gathering and processing, and (3) the interpretation of the significance of the scientific enterprise in the social context of which it is a part and with which it interacts.

The Formulation of Theory

Whatever impression may have been created by Marxist polemics at any given time, it is obvious that socialist theory has assumed that both qualitative and quantitative categories are indispensable components of scientific thought. The same assumption appears in every branch of political and legal inquiry, if one is willing to say that this distinction relates to the interplay between *context* and the *specification of context*. Even a casual inspection of the literature confirms the point that, when discussions are about the frame of reference within which inquiry proceeds, terms like "qualitative" enter into the debate; when the stress is upon a rather precise connection of theoretical models with a field of observation, the recurring term is some variant of "quantity." With certain exceptions to be noted presently, it is recognized that these are complementary parts of the whole intellectual task. Specification is essential if theory is to be put into operation; contextual constructs are essential if new lines of investigation are to be opened up. Actually, the interplay between these intellectual tasks is more subtle and interpenetrative than this mode of phrasing the matter may suggest. The challenge to translate general conceptions into operational indexes, for example, typically brings into focus the usefulness of introducing a series of intermediate categories of diminishing generality. Conversely, the results obtained by describing a situation in highly specific terms call attention

to the idiosyncracies of the local context when viewed in a wider setting, and lead to some revision of the categories of general reference.

Let us consider the two categories by which social processes (and hence legal and political processes) have often been characterized, namely, "material" and "ideological." The "material" category at the time it was introduced was richer in specific, measurable connotations than the "ideological." Hence the expected returns from scientific effort appeared to be greater by studying the material itself rather than studying ideological factors. Any attempt to specify the "material" calls for the introduction of subcategories. "Bushels per acre" is acceptable as an index of some forms of production (a material factor). But what measures the production of an entertainer or a propagandist? Is all production to be labeled "material," or are nonmaterial outcomes (such as laughter or belief) to be rejected as "production"? If the "material" is defined as including the technology of production, does the word "technology" cover the habits of the skilled worker, the knowledge of the engineer, the administrative strategies in factory organization, and the legal regulation of contractual agreements? Or are these phenomena more conveniently called "ideological"?

For many years the lines between "material" and "ideological" categories remained vague, partly because convenient indexes of the latter were missing. The scholars of our civilization think easily in specifics that refer to "thing" events, like bushels and bricks. They are less ready to translate into specifics when dealing with events that are variously called "ideology," "belief," "legal norm," "loyalty," "knowledge," and the like. As a beginning student of politics, I recall my dissatisfaction on realizing that, while economists were plentifully equipped with data about goods and prices, for instance, political scientists were poorly supplied with comparable data showing trends and correlations in political or legal events. Many scholars from many fields and many schools, including Marxists, were singularly vague about the precise interplay between "ideological" and "material" factors. I searched for ways of specifying these elusive ideological elements.

It was not too difficult, of course, to characterize the simpler aspects of a decision. For a long time voting statistics showing the results of popular elections have been kept; these could be used to specify the rise or fall of parties and individuals. Legislatures, execu-

tive and administrative agencies, and courts have kept records (with various degrees of completeness) of their own votes; these could be analyzed. But such operations did not carry us far. What factors directly affected voters, legislators, judges? In short, what events, presented at the focus of attention of the decision-maker and acting upon his predispositions (within the constraints of the current situation), accounted for the final outcome? How were these to be described in specific terms? How, in short, were such conceptions as "constitutional consensus," "underlying philosophy," "spirit of the time," "class ethos," and the like to be translated operationally?

Such questions led me to emphasize a greatly neglected category in political, legal, and indeed all social analysis, to wit, the focus of attention. To deal systematically with the focus of attention, we developed and applied methods of counting units of reference in the content of communication. Techniques of the kind (quantitative semantics) make it possible to use similar terms to compare what lawyers and witnesses say to the court, or what the courts say in justifying decisions (opinions). It is practicable to study not only what comes to the attention of the judge and jury in the courtroom, but what they say or write to one another during formal deliberations and informal contacts. The judge may be affected by what comes over television and radio during his leisure hours, as well as by what appears in newspapers, magazines, and law journals, or what is brought to his notice at home, at the club, and elsewhere. A comparable analysis applies to each voter (and voting group), legislator (and legislature), and any other participant in the politico-legal or the social process at large.

The techniques of content analysis, therefore, were an outcome of the pursuit of specificity within a comprehensive frame of social analysis; in turn, they accentuated the role of a category of events important in all interactions. For instance, in many instances "material" changes affect one another indirectly by first affecting patterns of attention, thereby inducing modifications of demand, expectation, and identification, which in turn influence behavioral expressions. Thus a flood that washes away bridges and retaining walls may do all its damage on only one side of a river as a result of someone's decision to concentrate protective efforts on the most valuable physical property, which lies on the other bank. "Ideological" innovations (such as a scientific hypothesis) typically affect other ideological factors by initiating intermediate sequences of events which combine

"material" and "ideological." In short, all factors referred to by such categories are interactive throughout the entire sociohistorical process.

The Number and Character of Key Categories

I have been describing some intellectual operations that either "fill in" or "expand" the original frame of reference. Another possible rearrangement is a change in the number of categories used at comparable levels of generality. I have been referring to a theory with a two-term set of high-level categories, "material" and "ideological." My impression is that as empirical research has proceeded in the social sciences these categories have been losing their former hold. Today the "material" is less plausibly set off from the "ideological" than it was. It is more in keeping with present perspectives to refer to "events" (subjective or not), and to assume that the operational indexes of "subjective events" will include both words and non-words. In modern medicine, for example, we take it for granted that some patients can be more expeditiously handled by communication ("psychic") therapy than by non-communication ("somatic") methods. Or a combination of methods can be employed; e.g., "brain washing" involves both communication and non-communication procedures.

In fact, two-term category sets are yielding to multiterm sets (in the interest of social process analysis). We are recognizing the convenience of emphasizing several value outcomes in the social process. Students of economics focus upon transaction outcomes involving wealth (claims to goods and services). Students of politics and law concentrate upon decisions involving power. My colleagues and I use six other categories to designate the other value outcomes in the social process (respect, enlightenment, affection, well-being, rectitude, skill). The process as a whole is characterized as man seeking to maximize value outcomes, within the constraints imposed by his total situation. All value-shaping and sharing activities are patterned —each pattern being a "practice" composed of "perspectives" and "operations"—and include in varying degree the use of the natural resource environment. The important methodological point is, not this set of specific categories, but the employment of a systematic multivalue contextual model of all social process events.

Within a contextual framework there is need of many systematic models of partial processes, such as the economic or political. This

contrasts with the past tendency, especially among non-Marxist thinkers, to devise partial models irrespective of their relation to the context. Some such partial models have led to highly successful results, notably in economic analyses of some aggregate market activities. But there are disadvantages connected with the emphasizing of highly formal systematic models connected only inadvertently with the social setting of which they are part. The result may be sterile scholasticism (as in the case of some academic economics); and there may be disillusioned revolts against systematic theory itself (as in many schools of business or public administration).

Systematic Contextual Systems

The central point as related to the present discussion is this: if the details of any social process are to be properly compared with the details of any other, and if a comprehensive social science is to be developed, detailed patterns must be located in terms of the same comprehensive map of the whole social context.

It is generally recognized among social historians with a world view that Marxist analysis has had, and continues to have, a strong appeal to the intellectually alert on strictly intellectual grounds, quite apart from other motivations, such as power or respect. As we have implied before, a factor that has contributed to the spread of Marxist analysis is the weight given to "material" factors and to the bodies of "quantitative" information available in support of theses alleging the decisive role of the material component. Socialist scholarship has never hesitated to take quantitative information in stride. But the impact of Marxism among scientists and scholars in many countries is also—perhaps chiefly—connected with the success of its systematic contextual categories in providing a frame of reference for the organizing of knowledge. When one interviews students and more mature intellectuals in any country or looks into intimate life-history records, a conspicuous fact is the sense of orientation that Marxist theory has given to so many of them. A common metaphor refers to Marxism as the turning on of a switch that suddenly suffuses a room with light, enabling one to see that the object against which he bumped his knee was a chair, and the cloth he had touched was a tapestry. Hitherto miscellaneous specifics fall into context. We all use this type of metaphor to convey the idea that some exceptional enlightenment has come to us.

Many intellectuals respond in the same way to Spengler or Toynbee, or, on a more restricted scale, to Max Weber, Schumpeter, or Karl Polanyi. These writers are often believed to do for the narrower field of human history and social process what religious teachers and metaphysicians have done for a less empirical realm. All these thinkers, however sound or unsound, have been systematically and comprehensively contextual. Those who deal with history and society provide a frame of reference (inclusive in space, time, and figure) regarding the event-manifold of yesterday, today, and tomorrow.

Suppose we strip the Marxist formulations of self-serving declarations about their "absolute truth" or the "inevitability" of what is said about future events, events that lie beyond contemporary observation. In a formal sense, declarations of the kind are not pertinent if we limit ourselves to what is designative and is actually or potentially open to observation. If we look at these writers in this more technical and restricted framework, it may be possible to uncover something of general importance to our principal interest—the structure of contextual systems.

The "Loose" Connection Between Theory and Data

A preliminary point concerns the relatively "loose" connection between many categories of such systems and the data on hand at any given cross section in time. In part, the relative looseness comes from the lack of carefully defined indexes systematically applied to available evidence, such as would make accessible to the investigator comparable data regarding trends and distributions, and would foster the discovery of correlations among various factor combinations. Even where operational indexes exist, there are regrettable gaps. Did you ever try to ascertain the voting record of courts, executive and administrative tribunals, legislatures, and electorates in this country as of the past year? Or ten years ago? Or a century back? Or have you had occasion to examine the present state of basic trend, distribution, and correlation information about the relative frequency with which the courts have invoked particular constitutional clauses, past decisions and opinions, in cases in which comparable parties were making comparable claims, represented by comparable counsel, growing out of comparable precipitating events? If so, you are well briefed about the spottiness of the reports now at hand, and recognize why we have put so much stress upon the importance of

designing a more satisfactory continuing survey of social intelligence. If your requirements are stricter and you ask about the attention frames (social perceptions) and the perspectives of participants at various stages of a decision process, you are indeed doomed to great disappointment.

Contextualism in Space

Part of the attractiveness of systematic contextual theories is that they are spatially inclusive in reference. This enables the scientific observer to locate his tree in the woods. In principle, it becomes possible to put any specific event in spatial relation to the points of origin of the pattern it exemplifies. Such an ample context enables us to recognize any variations in the pattern that signalize (1) an innovation, or (2) the partial incorporation or rejection of alternative patterns, or the dropping or modification of details of previous forms of the pattern which it most closely approximates. In a given case, doctrines altered by the Supreme Court may be traced as far back as colonial times in this country, pursued across the Atlantic to England, and eventually connected with the doctrines prevailing at a given phase of Roman history. The legal formulae we call the laws of property and contract, for instance, have many lexical continuities and definitional equivalencies in the great digests of the Roman era.

Detailed investigation shows, however, that terms are defined differently, or that equivalent definitions are labeled differently than they once were, owing in some measure to the partial incorporation of local legal doctrines and practices. Further inquiry may show that seeming similarities are utterly superficial. When we examine the context of a decision, it appears that the doctrines are invoked by quite different parties to litigation, on behalf of claims that contrast sharply with the claimants who appeared before the magistrates of imperial Rome. Moreover, the events that precipitated the contemporary controversy are very different. Finally, the predispositions of the decision-makers are in great contrast to those of the magistrates of antiquity, and the outcomes and effects are not the same.

Findings of this kind are in no sense new to the political and legal sciences. What is supplied by a world-inclusive framework (or rather, an inclusive interaction area) is the emphasis on distinctive and important social patterns whose centers of origin, zones, and routes of diffusion and restriction can be sought. In the case of Toynbee, for instance, the significant units to follow are "civilizations."

For Marx and Engels, the key units to be identified and examined are social classes (class societies like feudalism and capitalism). These exemplify one of the most significant contributions made by theorists of society—namely, the identification of the principal units whose interactions are regarded as worth pursuing.

Contextualism in Time

Contextual theories are inclusive in time as well as space; they refer to events in the future as well as those in the past of contemporary inquirers. In this connection I distinguish truly "developmental constructs" from other future-reference models. A developmental construct is put forward tentatively, not dogmatically; and it depends upon the critical examination of past trend and distribution data, and of scientific propositions that have been at least partially confirmed by correlational and experimental methods. Past trends, when extrapolated, characteristically indicate the probability of future conflict in particular zones. Hence, whatever knowledge of the interplay of scientifically investigated factors is at hand must be drawn upon to assess the probable resolution of future conflicts.

In the nineteenth century in particular some of the most inclusive theories of past and future history took their cue from unilinear theories of biological evolution. Sir Henry Maine's characterization of the course of legal evolution as "from status to contract" was widely considered as indicating that in our time the world was moving toward the substitution of deliberately made agreement, in place of the obligations of traditional societies. More comprehensive theories of society, such as those of Spencer and Comte, saw human history as striding away from theocratic or military forms and toward more rational peaceful and permissive institutions.

Strictly speaking, these are not exemplifications of developmental constructs, since they purport to be grounded upon scientifically valid propositions about the determinants of social evolution. We can reject the scientific propositions as doubtful, yet tentatively adopt a Spencerian, Comteian or Marxian model of the distinctive features of future periods. By assigning some estimate of probability to the model, we can then employ it to guide our scientific man power and resources to the consideration of especially important factors in the social process. I have, for instance, put forward in place of the Marxist construct of the proletarian revolution, followed by the

commonwealth of free men, the model of a continuing crisis leading to the universal dominance of new social castes depending upon the control of instruments of coercion. Although this construct was no more than a sketch, it helped to focus some scholars upon civil-military relations and upon the factors affecting the political-military use of the new technology stemming from the recent explosive development of physics and chemistry. Among other things, it has been possible to mobilize a few legal scholars to anticipate, in advance of their appearance, at least some of the problems of weapon surveillance, weather control, the penetration of outer space, automation, artificial insemination, and such.

Functional Reinterpretation of Conventional Meanings

Perhaps it should be made more explicit that a principal scientific task in examining the social process is to confront conventionally defined relationships with the results of functional analysis and research. In conventional terms, we refer to various legal doctrines as "property law," and to various organizations as "business corporations" or "courts." Part of the lure of the qualitative categories of Marxism has been that they encourage intellectuals to discover new linkages between the conventional institutions of a given epoch or locality and the manifold of events in which they are embedded. With the postulation that nineteenth-century Europe was "capitalist" and that the future was to be "socialist," and further that whatever led to socialism was "progressive" and whatever sustained capitalism was "reactionary," the conceptual scene was ready for the inspection of every detail, according to the degree in which the pattern of the future would be expedited and the older pattern weakened.

As the context unfolds, the significance of any specific pattern is likely to change. Thus a standard hypothesis (often a dogmatic conclusion, of course, but not one that necessarily affects the validity of the result) was that parliamentary democracy, which first performed "progressive" functions in the struggle against feudalism, later became perverted to "reactionary" functions by the private owners of the tools of production. It is not necessary to emphasize that research as well as propaganda has been inspired by such hypotheses. In our society some of the fear of empirical social science among businessmen is accounted for by the uneasy sense that there is something in hypotheses of this kind, and hence that such studies

may endanger the political support upon which business institutions depend.

I suggest that not only empirical research but also contextual theory suffer from such apprehensiveness. Do we not also discover among social scientists some unwillingness to give prominence to hypotheses that may be widely interpreted as inconsistent with prevailing ideology? Such reluctance would be expected among individuals who were at one time identified with Marxist activities, which they abandoned, largely on grounds of expediency, without thoroughly reorganizing their intellectual position. Here is where preoccupation with partial and highly formal systematizations, or with limited quantitative problems, might be expected to keep vulnerability at a minimum.

My view is that systematic multivalued models of the social process (including of course politico-legal components) are more searching intellectual devices than the earlier socialist models, which, like the capitalist ideology they fought, exaggerated the role of "material" factors. This is not the place to argue the position; I remark only that the multifactor approach to the study of man in society tends by now to have made this proposition more acceptable than formerly.

Our confidence in multivalued "systematic functionalism" must be justified by contrasting it not only with other systematic and single-valued systems, but with unsystematic functionalism. Social anthropologists of the functional school made a great contribution to all the social sciences when they demonstrated the contextual principle. But the research reports prepared under the inspiration of functionalists have lacked comparability. Thus if we learn that the fiesta in one village attracts storytellers and ballad-singers who use their talents to provide political news of the outer world, we are justified in saying that one value effect of the fiesta is to provide political enlightenment. But reports on other village fiestas may say nothing about the dissemination of political news. Does this mean that there was none, or that the observer neglected to look for it and note it down?

Systematic Functionalism

What is involved in systematic rather than unsystematic functionalism is suggested by the following questions relating to the legal system of a body politic, studied through time or compared with other systems described the same way. What features of the de-

cision-making and executing process are given legal protection, e.g., are voting frauds illegal in formal prescription and effective fact? What economic practices (institutions) are legally protected, e.g., are business monopolies broken up or regulated? What skill opportunities are legally provided, e.g., are opportunities for vocational training freely offered? What institutions of respect are given the support of the law, e.g., are families assigned to ranks carrying privileges? What institutions of enlightenment are given legal support, e.g., is there freedom of the press from official censorship? What affection institutions receive legal protection, e.g., under what circumstances can marriages be dissolved or otherwise terminated? What rectitude institutions are protected, e.g., are there established churches? What well-being practices are legally sustained, e.g., are basic medical facilities open to all?

The previous questions point to the system of public order, which we define as the patterns of value distribution and the basic institutional practices protected by law. (Law refers to the decisions which are supported if necessary by severe deprivations directed against challengers.) One goes on to inquire into the degree in which each value is maximized by individuals operating within the constraints of their societal configuration.

If one explores a community in orderly fashion through time, it is possible to show how the conventionally recognized structures change their position in the system of public order, and the degree to which this affects the shaping and sharing of values. The continuing confrontation of conventional conceptions with functional analyses is perhaps the most distinctive contribution of political science, jurisprudence, and other social disciplines.

Some of the protest against "statistical busywork" and other real or imaginary targets seems to stem from a fear that investigations of a contextual kind will become less frequent. But it would be a mistake to imply that contextual theory is independent of "quantification," of statistical investigation. If we turn to some of the famous researches that have performed the confrontation function in political science and law, we immediately see that they have made full use of numerical material. Think of Robert Michels' classic demonstration of how socialist (Social-Democratic) parties in Europe were run year after year by self-perpetuating oligarchies—a proposition supported by data as to the social composition of socialist parties and the class origins of officials—or E. J. Gumbel's comparisons of the

treatment by Weimar judges of defendants who were "Rightists" (members of "patriotic societies") or "Leftists" (members of Socialist-Communist organizations), and who were accused of political crimes. The "Leftists" were less often released than the "Rightists," and their sentences were many more years per capita than those of the "Rightists." The scientific proposition that courts tend to *indulge* defendants with whom they identify positively, and to *deprive* defendants with whom they identify negatively, is less important than the report upon the strength of such variables at specific cross sections in time and place. Or recall Charles A. Beard's emphasis upon the economic considerations alleged to have affected the perspectives of our constitutional forefathers. Among the researches that have convincingly emphasized the role of such values as respect, affection, and enlightenment within an industrial society, I mention but one classic, the detailed studies, largely influenced by Elton Mayo, of the output of factory workers, whose production went up so long as they had a congenial human situation and believed that what they were doing would be a pilot model for the reduction of friction in industrial relations.

In our civilization, it appears that the quantitative dimension must be added, even to increase the acceptance among intellectuals, as well as the community at large, of many ethical assertions.

We are coming close in these allusions to the debate over quantification that is so frequently initiated by "humanistic" scholars and that seems so capricious and wrongheaded to scientists. I put to one side the dogmatic assertion that "the human spirit cannot be measured." Social scientists have enough experience to feel sure that they do not have to be perfectionists in order to go a long way toward explaining many of the perspectives presumably included as referents of "human spirit." The "political arithmetic" of the seventeenth century led to the gathering of information regarded as essential for purposes of military policy and revenue. National governments learned to keep or to encourage the keeping of statistics about population, wealth, and trade. Only recently have students of law, politics, and government taken the initiative in gathering information whose principal use is the advancement of knowledge.

Conclusion

The foregoing examination of qualitative-quantitative categories in political and legal analysis has noted some of the connotations

attached to the distinction. Practically every connotation makes a valid if limited point, including even those meanings assigned by slogans created for political purposes. Our interest in this colloquium is to deal with quantity and quality as recurring categories in the language of inquiry. Hence we have been most attentive to the distinctions that appear in the formulation of theory, the connecting of theory with observational fields, and the clarification of the interplay between the scientific enterprise and the sociohistorical process of which it is a part.

Perhaps the most relevant over-all point relates to the indispensable role performed by the qualitative as well as the quantitative in the tasks of inquiry. In legal and political analysis, for instance, intellectual activities typically move from any given starting point toward more inclusive contexts, or toward a greater specification of acceptable working connections between categories and observational fields. The former is the qualitative direction; the latter, the quantitative.

In many ways the most interesting utterances that make allegedly qualitative or quantitative distinctions refer not to questions of method but to substantive propositions about social change. Admittedly cryptic statements about the transformation of the qualitative into the quantitative, or the reverse, are not amenable to inquiry. But they are challenging if used to stimulate consideration of the circumstances likely to culminate in "cumulative" or "abrupt" politico-legal change.

Some problems of method have not received a generalized solution. I refer to criteria for the degree of quantification to be sought in political and legal researches. Fortunately we are able to obtain the advice of specialists in mathematical statistics in seeking to clarify the cost of achieving in particular problems (or problem categories) a stated level of verification by a stated degree of quantification. Cost, of course, is not solely a matter of man-hours and apparatus; it includes other social values. And cost estimates need to be put in the context of alternative scientific programs.

Creative tension between the qualitative and the quantitative becomes of increasing rather than diminishing importance as we perfect comprehensive and continuing intelligence surveys of world social process, and use more "intensive" tools to disclose the structure of predisposition in every principal context.

OPINIONS AND ISSUES

Is Preventive Psychiatry Possible?

LAWRENCE S. KUBIE

THERE ARE no easy answers to any of the difficult questions with which preventive psychiatry confronts us; but questions to which we have no answers can nonetheless be useful. It is valuable to recognize the presence of an illness long before we can diagnose its precise nature, much less cure or prevent it. Physicians are reconciled to this fact. Even laymen accept this in medicine, yet tend to be resentful of it in social issues, or in such medico-social problems as the present topic.

Preventive psychiatry derives its vision, its data, and some of its techniques and strategy from the study of mental illness and from the therapists' attempts to interrupt and reverse the causal chains producing psychological illness. The larger goal of preventive psychiatry is a human nature released from the rigidity that limits our freedom to change, destroys our capacity for happiness even under favorable circumstances, and distorts our creative potential in science, in art, music, and literature, in scholarship in general, and in politics and economics. Indeed, this is the most difficult problem in human culture: to learn how to bring ourselves up freed from the tyranny of stereotyped, rigid, unlearning, unconscious psychological mechanisms.

The implementation of any such vision will demand several things:

(a) A more precise knowledge of the psychological development of the human infant, leading to the discovery of new techniques for guiding, modifying, and controlling that development. This implies the introduction of measures to prevent the neurotic process *before* its onset.

(b) The application of methods to correct and reverse the neurotic process in its early stages. This will require the training of many more individuals in the diagnosis of potential illness before frank ill-

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ness has crystallized, and in its treatment in its larval stages. This is no "minor" psychiatry, comparable to "minor" surgery. It is "major" psychiatry, precisely because it concerns itself with subtle early deviations from the normal, rather than those more obvious, late disturbances which bring most patients to the psychiatrist's consulting room or to the psychiatric hospital.[12, 15] Furthermore, these early manifestations occur largely in nonmedical situations; and their recognition and treatment must take place where they are found. To meet this challenge will require an increase in the number of behavioral scientists educated, certified, and licensed as qualified psychodiagnosticians and psychotherapists, without requiring that they be physicians. The medical profession alone cannot meet this need because there will never be enough medical specialists for this task. This is the bottleneck which must be broken.

(c) The development of new educational techniques to help reunite psychological processes which had become dissociated, instead of increasing repressive dissociations, as occurs in education as we have known it.[10, 13, 14]

(d) Finally, preventive psychiatry will demand a critical re-examination of the influence all cultural institutions exercise on the evolution of the neurotic process. Among the factors to be studied are: the structure of the modern family; the impact of longevity and of over-all increases in the population and in population density; the changing age distribution and regional and occupation distribution of the population; the mixed constellation of therapeutic and noxious influences emanating from the several religions as presently organized and practiced; the effects on the neurotic process of various movements within the visual arts, music, and literature; the exploitation, reinforcement, and rewarding of the neurotic component in human nature by every type of economic system man has devised; and the many psycho-noxious influences that emanate from every political influence known. Even this incomplete list makes it obvious that merely to conduct an objective inquiry into these problems will arouse the opposition of every vested interest in our complacent society.[17, 19]

When Henry Adams returned to Boston after a long absence, he remarked on his surprise at finding that the Unitarians who dominated the Boston culture of that day seemed to believe they had solved every great philosophical conundrum that had ever convulsed the human spirit.[1] Were he to revisit America today, he would be moved to make a parallel comment about our illusions as to the per-

fection of our political, economic, educational, artistic, literary, and religious systems, each of which interacts in its own way with the ubiquitous but masked neurotic ingredients in so-called "normal" human nature.

Neurosis and Repetition

In another connection[5] I have pointed out that a neurotic potential exists in every child, not so defective as to be incapable of learning symbolic thinking, feeling, and action. This potential becomes entangled in the neurotic process when under stress any dissociative repression occurs, i.e., when the link is severed between memory traces of events and their appropriate affects, or when the link becomes distorted or repressed between the symbolic representatives of inner or outer experience and that which the symbol originally stood for. The neurotic process is manifested primarily in personality disturbances. Under special and critical conditions of decompensation, the neurotic state precipitates out of the neurotic process as a constellation of symptoms.

Clearly, prevention must concern itself with the neurotic potential and the neurotic process. It cannot hope to achieve any material reduction in the toll of neuroses if it waits for the imminent occurrence of the neurotic state—the final and most easily recognized, but in a sense the least important, step in the series.

Every moment of behavior is produced by a constellation of concurrent forces. Whenever this constellation is of such a nature that it predetermines the automatic repetition of any pattern of action, thought, or feeling, the result is neurosis. This is our most precise and concise definition of what we mean by "neurotic" as distinct from "normal"; it is an obligatory repetitiveness, predetermined by the pattern of the forces that produce the act.[8, 9, 11]

Yet repetitiveness is necessary to life. From the first moment, we breathe and suck, not once but repeatedly. Every bodily need makes itself felt many times. Every gesture, thought, and feeling, and their communication, are repeated. Therefore, repetition is an essential attribute of behavior. Furthermore, data from modern neurophysiology indicate that the organization of the brain is such that its processes tend to continue and to recur unless some active process arises to divert them. It is "easier" for the brain to go on doing the same thing than to change.

This is normal as long as the inherent tendency to repeat alters in response to the changing demands of body chemistry as signaled from the body to the brain through its internal afferent signaling system, both conscious and preconscious. Normal repetitiveness must also be free to alter in response to signals reaching us from outside the body (signals we see and hear and apprehend through all modalities of sensation) and to the signals called symbols.

Organic injuries to the brain can render it nonresponsive to both external and internal signals, thus producing organically determined repetitiveness. Such injuries can be structural, through direct injury or infection, or they can be chemical, through fever, intoxication, and drugs. But the frozen repetitiveness resulting from organic damage is not the object of our concern.

In the neuroses, the capacity to change in response to changing external or internal stimuli is impaired without the interposition of any of these organic variables which can impose automatic repetition on behavior.[8] Even with a normal nervous system and a normal biochemistry of the whole body, an obligatory repetitiveness can be imposed on human conduct by psychological variables alone. As already stated, this occurs whenever behavior is dominated by symbolic processes whose roots and relationships are unconscious. Again, neither conscious nor unconscious symbolic processes ever operate alone, but always act concurrently, though with a varied distribution of influence. Moreover, they always exert their influence on thought, feeling, and behavior largely through the continuous central stream of preconscious processing. Where conscious processes exercise the dominant influence on preconscious processing, the resulting behavior is continuously adaptive and responsive to experience, past, present, and future. Consequently, the resulting behavior can be altered by rewards and punishments, by argument, exhortation, and reason. It can respond to success and failure. It can achieve satiation. It can alter after testing the usefulness and the effectiveness of effort. In short, it can learn, since it is flexibly responsive to signals both from the outer world and from the body. Where conscious processes dominate, any repetitions which occur are normal expressions of voluntary choice or of the recurrent tidal needs of body chemistry, or else they are part of the learning process.

On the other hand, where the preconscious processes that mediate behavior are under the preponderant influence of unconscious purposes and conflicts, any pattern will become stereotyped, inflexible,

and insatiable, uninfluenced by any appeal to feeling or to reason, incapable of learning from experience and of assembling data creatively into new combinations. Whenever unconscious influences dominate, it becomes impossible for preconscious functions to create anything new. They are restricted to restating the old in a variety of more or less interchangeable symbolic languages. This, of course, is precisely what occurs in much of the neurotogenically overdetermined "modern" modes of art and literature.[18] Unconscious psychological processes impose this rigid stereotype on preconscious processing precisely because the symbols representing them are distorted and dislocated from their roots. Since we communicate by means of symbols, wherever such a distortion of the symbolic process occurs we become walled off from the corrective, guiding, feed-back influences of internal or external realities.

This is where psychogenic psychological illness starts. No isolated or transient episode—whether a moment of rage, terror, elation, or depression, or a quick explosion of odd or inappropriate behavior—constitutes an illness. Only if the response becomes an emotional position to which the individual returns like an automaton, only if the individual begins to show fear, rage, depression, or anxiety in an insistent or repetitive manner irrespective of the stimulus, only if any triggered pattern becomes automatic, stereotyped, and repetitive, can we say that certain mechanisms have taken over to predetermine the automatic and obligatory repetitiveness which is the core of that which is neurotic in human nature.[5, 7, 9, 11]

From this point of view, the neurotic ingredient in human nature results from the enslavement of behavior by psychological processes inaccessible to our own conscious self-inspection and control. This is the unhappy consequence of the dichotomy of symbolic processes into two systems, in one of which the roots and ramifications are predominantly conscious, whereas in the other they are predominantly unconscious. It is this dichotomy which must be one of the primary targets of preventive psychiatry.

The early manifestations of neurotic repetitiveness are seen in the repetitive play of infancy, or in the familiar wailing, thumb-sucking, rocking, head-bumping, toy-dropping, and night terrors, or in the regurgitation, retention, breath-holding, etc., which characterize some of the transitory neurotic episodes of infancy. We are so accustomed to these events that until recently they were dismissed as unimportant. Yet such transient examples of obligatory repetitions

of behavior and feeling are warning signals. Each represents an inner disturbance which will remain active unless it is fully resolved. Otherwise, a constellation of symptomatic acts may disappear, but it will be replaced by another.

These buried and unconscious processes become time bombs with slow fuses. Their masked effects are cumulative, coalescing in the end to form the neuroses and ultimately the psychoses of adult life. These residues may be explosive charges which can be touched off by appropriate trigger stimuli into frank neurotic and psychotic states, or they may exercise a continuously deforming influence on the quality of an entire personality, on the quality of his creations, and on the patterns of his living.

Since they are first laid down in fragmentary fashion during infancy and early childhood, it is at this early age that we must search for the key to prevention, learning how to limit the dissociations that can occur between the symbolic process and what it attempts to represent. After such a split has occurred, it must be detected at once and a resynthesis achieved before cumulative injury occurs to the developing personality of the infant and child. But there are important differences between limiting, checking, or preventing fission when it threatens, on the one hand, and a therapeutic re-fusion after the initial fission has occurred, on the other. If the effort is made early enough, both fall within the field of preventive psychiatry. But if fusion is undertaken only after many secondary consequences of the initial fission have already accumulated, then the process of therapeutic fusion requires those heroic investments of time and effort which constitute psychotherapy and psychoanalysis as we know them today.

Prevention and the Human Family

The family is a protective environment arising around one or more adults on whom the infant, the toddler, or the child depends, to whom he becomes attached, with whom he identifies, whose images he builds into himself, and who become the objects of intense rivalry, love, fear, hate, and envy. Only a small part of this struggle is experienced on a fully conscious level. Most of it goes on preconsciously; even a great deal of that part of the struggle which receives symbolic representation is subjected to dissociative (i.e., repressive) processes, so that it is represented in partial and distorted fashion by symbols of whose true nature we may be unaware.

Consequently, although the family is necessary for human life, it is at the same time the soil in which the neurotic process takes root. It is out of the tense interpersonal and growth struggles of the nursery years in the family that illness and feuds arise. It is an area for basic research to determine how the family as a necessary institution can be modified so as to yield a larger crop of health and a smaller crop of illness.

There has been a small beginning in this direction. In fact, there is a cultural revolution even in the implications of such a change of phrase as this: whereas former generations said, "What did I do to deserve a brat like that?" the present generation says, "What did I *do*?" This is a valid and moving expression of humility and search. Although at times it goes too far and involves us in fantasies of parental omniscience, omnipotence, and guilt, it represents a trend in a healthier direction, and the overswing will soon be corrected.

Yet to ask this question is one thing. To define what we could have done to prevent illness is another, involving considerations of education, of religion, of social structure, of population growth and density, of sex and age distribution within the population, of economic influences, of family size and units. The family is not an isolated or static entity. In every conceivable aspect the family as a breeding ground of health and of illness is changing rapidly in an intricate network of cultural processes which are also changing. All we can say now about the effects of these changes is that we do not yet know enough to guide them in a preventive direction.[4, 19]

We know that love is essential, yet that alone it is not enough: we see many children with severe neuroses coming even out of loving families. We know that faith is not enough—many neuroses arise among the devout. We know that doubt and skepticism are not enough, because they too afford no protection against the neurotic process. Similarly, we can say of simplicity or education, wealth and comfort, poverty and deprivation, ease or suffering, overwork or underwork, that none of these serves a preventive function. If any one factor plays a crucial determining role, it would seem to be the openness with which experience is shared among the generations, since it is the level of awareness on which experience is lived through and on which memory and feeling reverberate which determines whether or not it will give rise to obligatory and repetitive patterns of neurotic distortion. Here the child needs help from the adult world, in thinking and speaking out what is painful to recall and

put into words, in place of silent acquiescence in unhealthy pseudo-forgetting.

The Conspiracy of Silence

Early analytic insights engendered naïve hopes that merely to allow a child to act out his spontaneous impulses would protect him from the cumulative neurotogenic effects of repression. It soon became clear that this was not so, but that on the contrary in the child who acts out his primitive, destructive, lustful, insatiable, and unattainable needs, the very violence of the impulses of which his behavior is a partial expression engenders deep terror and guilt, with spontaneous repressive repercussions. On the other hand, where timid adults shroud the critical inner experiences of childhood in silence, the neurotogenic effects of these experiences are intensified. Indeed, this is precisely where the conspiracy of silence enters into the evolving neurotic processes of youth. The conspiracy of silence, therefore, may perhaps be looked upon as a central target for research into prevention. There is still no general appreciation of how subtle and complex is this conspiracy, how insidiously it irradiates every aspect of child life, how difficult it is to correct, and how much basic research must be done before anybody can hope to offer better alternatives. As usual, it is easier to recognize that something is wrong than to correct it. Nevertheless, its recognition is an essential prerequisite to future prevention.

The conspiracy of silence establishes the basic pattern of that type of fragmentation and dissociation called repression. It implies in the first place a silent acquiescence in a child's confusions. Moreover, these confusions actually tend to be greater for the bright child who acquires words early than for the verbal laggard, because the linguistically precocious child picks up many verbal symbols whose meanings to him are obscure and overlapping. Yet instead of being helpfully and quietly corrected, his verbal precocity is hailed and his confusion is thereby increased. Every bright child harbors countless confused thoughts and confused fantasies, many of which he himself does not even apprehend clearly enough to express in words, unless he is helped to do so by the adult world. If the world does not deliberately bring them out into the open by helping the child to become articulate about his confusions, spoken or unspoken, the child mistakes adult silence for agreement, and they remain uncorrected until at length they are repressed. Furthermore, what

the adult world does not talk about becomes itself taboo, just as those parts of the body which the adult covers automatically become taboo.

There are many subtle irradiations from this taboo of silence. Consider the words "private," "privacy," "private parts"—the nameless parts which are special and peculiar to "me" and which "I" must never acknowledge, explore, think about, name, or compare. The mere impulse to inquire and to find out about them is in itself a sinful proof of an inner evil of heart and mind. This feeling spreads to include all body functions. Something happens to the baby's image of himself when the potty ceases to be a proud, happy, social function, but is moved from its dais in the center of the nursery floor and shut away behind closed doors in a room that resembles an operating room in its aspirations to cleanliness. Under the euphemism of modesty, shame is born—shame about the body, its apertures, its products, its smells. The toilet becomes a room to which we refer only by guarded, nice-nelly euphemisms—"the john," the *lavatory* (to stress cleansing instead of excreting), the *little* boy's room or *little* girl's room, as if it becomes slightly less filthy when dedicated to the child's excretory rites.

Moreover, the concept of the privacy of dirt comes to include the family. For each small child there are things he does, talks of, smells, and experiences, but only in "my family." This means to him that only *my* family is dirty, dirtier than the rest of the world. One wonders how much of social snobbery, how much of the cult of the untouchable, is at least in part a compensatory reaction to the child's feeling that "my family is dirty," a thought so painful that it usually is repressed.[3]

Nor are these wordless taboos restricted to sex or to bodily things in general. They are operative also in regard to death, disappearance, desertion, and pain. In television, movies, and comics we expose our children to vicarious participation in primitive, gory, and sadistic brutalities, and with all the artful simulation of the sight and color and sound of blood and death and agonizing tortures. Everything but the smell of death is reproduced; and if this becomes sufficiently profitable, Madison Avenue and Hollywood will add that too. We immerse children in a facsimile blood bath—but we are much too nice to talk to children about such things. Consequently each child buries his mixed responses to all this deep in his angry, frightened, and suffering heart. He cannot share it: therefore he cannot clarify

it with anyone. Instead, so as to leave our own comfort undisturbed, we pretend that what the child does not ask about has no effect on him. This is the measure of the immaturity and moral complicity of the adult world. If we talked about it, we then would have to do something about it. This would bring us face to face with the entrenched interests of Hollywood and the advertising sponsors of crime television.

In sum, by our silence we create a hierarchy of evil for the child. There are things he can touch and put in his mouth. These are clean. They are not dangerous. Next are the things he can touch but cannot put in his mouth. These are the first degree of danger and dirt. Next are the things he cannot touch but can look at—though perhaps a bit askance. These are the second degree of dirt. Then there are the things he must not even look at, followed in quick succession by the things that must not be talked about, the nameless things about which he must not think or feel.

What the child cannot feel, or talk about, or name, or even think about, automatically becomes repressed. The nameless loses its link to any conscious symbol, and it can be represented only by distorted, masking, dissociated symbols. This is the essential step in the process of repression because it isolates objects, acts, impulses, events, and inner conflicts from those verbal symbols by means of which we are enabled to think, to communicate, and to inquire. This makes correction impossible. Furthermore, although the conspiracy of silence severs or distorts the links between the symbol and its roots, the emotions *are there still.* Yet because they too focus around the unnamable, the wordless, the unthinkable, the untouchable, they also become detached from anything the child can think about and correct. They become free-floating emotions, balloons floating in the air of the child's psychic life. This is what the conspiracy of silence does to the evolving verbal, symbolic, and affective life of childhood.

It is not the trauma of experience or the stress of inner conflicts among irreconcilable impulses that determines sickness or health—this depends on the psychological level on which the reverberations of trauma and the stress of inner struggle are lived out, and this level in turn derives mainly from the adult conspiracy of silence. To all this, of course, the adult adds still further confusion by never bringing his own mistakes out in the open, thus making sure that neither he nor his children nor his children's children will ever learn from past errors, our only potential source of wisdom.

The moment one begins even to contemplate an attack on this multiform and subtly pervasive conspiracy of silence, he finds himself up against taboos that have been strongly entrenched, sometimes for centuries, not only in each individual's separate feelings, but also in laws, traditions, rituals, religious taboos and pronouncements, and above all in our family life, the universal breeding ground for neurotogenic unconscious conflicts. The details of this conspiracy, its form and impact, vary from culture to culture, but no culture is free of it. Nor have our cultural anthropologists or social psychologists made objective comparisons of cultures, specifically in terms of the variations to be found in the conspiracy of silence, the variations in the repressive mechanisms it imposes, and the consequent variations in the forms of the neurotic processes which evolve.

Prevention and Education

If we wish to make education an ally of psychological health, we will have to weigh the effects of every ingredient in the conventional educational scene and in the customary educational techniques on the activity of neurotogenic forces.[10, 14, 18] We must develop methods to counteract the tendency to fragment experience into unrelated parts, to dissociate thinking, feeling, and action from one another, to bury one fragment and then to represent it in distorted form by means of symbols which are dissociated from their origins. Since creative preconscious processes become imprisoned in the dichotomy between conscious and repressed symbolic processes, any control of dissociation and repression will profoundly influence emotional maturation, intellectual development, and above all the free play of creative imagination.

Such efforts would begin in the nursery school and kindergarten, since here the child first acquires his capacity for symbolic thinking, for feeling and communicating through gesture, mimicry, and sound, even before he learns to use the more highly developed symbolic functions of speech, reading, and elementary arithmetic. To free a child in this way will also free his acquisition of the basic tools. The three R's, as well as the plastic, rhythmical, and musical arts, will benefit. Thus the prevention of neurotogenic processes at their sources would enhance the efficacy of our entire educational system.

From the toddler years to the top levels of postgraduate education, we need school techniques by which dissociation and repression

among the various ingredients of psychological function would be limited or reversed as quickly as they start, so that thinking, feeling, and acting would develop as well-synthesized and unitary expressions of an evolving personality, instead of as erratic outcroppings from fragmented and dissociated functions.

Let me repeat that to limit fission is not identical with psychotherapy, which aims at reuniting components which have already been split. In psychological matters, as in physics, the process of fission can release destructive energy, and again as in physics the process of fusion may be accompanied by dramatic explosive discharges. There is no reason to believe, however, that this would be true of procedures by which the primary fission itself was limited or prevented. Therefore, although we have learned our basic principles from the treatment of the neuroses and psychoses, the implications of early psychotherapy are not identical with, and should not be confused with, psychotherapy.

Interactions Between Social Processes and the Secondary and Tertiary Consequences of the Neurotic Process

Resistance to change is deeply entrenched in all institutions, and the history of all preventive medicine is marked by opposition. An unsparing effort toward the preventive use of psychiatric knowledge and techniques would challenge every human institution. In the face of this challenge, education, religion, industry, and government will have to manifest a humility and honesty to which they are not accustomed.

In addition, it is in the essential nature of that which is neurotic to stay put. Self-examination that might lead to change is therefore opposed with fear, with the anger born of fear, with tenacity and desperation. Everything sick in human nature manifests this obstinate reluctance to change. Individually, this is evidenced by our patients. Socially, it is shown by our defense of cultural institutions that have repeatedly demonstrated their impotence or their actual pathogenicity. Therefore it is not surprising that the ubiquitous yet masked neurotic process struggles to go on being and doing, just as in the past.

We have no evidence that social forces per se are responsible for the ubiquitous neurotic potential, or that they generate the neurotic process that derives from it.[5, 9, 11] We do know that they help to

shape it, and that in every known culture man is surrounded by social forces that interact in complex ways with both the neurotic process and the fully developed neurotic state.[17] The present inquiry will be clearer, therefore, if it distinguishes among these social forces: (a) those that conceivably generate neuroses (an uncertain and debatable claim); (b) those that exploit and prey upon neurotic trends extant in human nature; (c) those that intensify such trends by actively rewarding them; (d) special vested interests that oppose change; (e) deeper individual biases, both conscious and unconscious in origin, that oppose any change even for the better.

By implication this position challenges many frequent assumptions about the ease with which the neurotic process can be averted or limited. I want to underscore this. There can be no doubt that the cultural organization of any society influences both the neurotic process and the price its citizens pay for their neuroses. This, however, is far from claiming that cultural differences can either initiate or prevent the neurotic process. Yet it is always tempting to blame neuroses on aspects of life which for other reasons may be undesirable. Thus we find people who in the same breath say that neuroses are due to poverty and that they are due to wealth, that they are due to overwork and to leisure, to sleeping too much or too little, to ignorance or to excessive education, to superstition or to supersophistication. Others blame neuroses on a lack of love or on excessive loving, on neglect or on overprotection. Neuroses are blamed on the simplicity, barrenness, and isolation of country life; or on the complexity, congestion, and pace of urban existence. Primitivism is blamed, or the rarefied and precious atmosphere of a highly cultivated society. Some blame neuroses on doubt and cynical skepticism, others on credulity or an overcompliant and passive acceptance of religious faith. Thus we find neuroses blamed with splendid impartiality on religion and on skepticism, on puritanism or on license. There was a period not long past when neuroses were blamed on close family ties. This is implicit in certain novels of Louis Couperus, Henry James, G. B. Stern, Louis Golding, Wasserman, and Thomas Mann. In all this fiction we find the masked manifestations of secret accumulations of inexpressible patricidal, matricidal, fratricidal, and incestuous rivalries and tensions within close-knit family units. Conveniently forgetting all this, however, people today place the emphasis on domestic turbulence, family disruption, and the loosening of family ties. Superficial observers blame the breakdown

or attenuation of family life, rather than viewing these as important manifestations of the ubiquitous neurotic process.

In this connection we should consider the statistics of the situation, if only as a warning against the kind of fallacy which is so easily substituted for thinking. I have in mind two basic facts: (a) that nearly 20 per cent more of the total population are married today than seventy years ago;[18] and (b) that in 1890 families were disrupted and reshuffled by early deaths at a greater rate than occurred through divorce in 1940.[4] During the half-century between these dates the rising divorce rate did not keep up with the falling death rate. One would not hold that the impact of reshuffling because of divorce and the impact of reshuffling because of early deaths are necessarily the same. Certainly, when the reshuffling is because of early deaths it presumably follows a shorter period of family tension, since people may die before intrafamilial tensions have had time to reach explosive states. But which does the major damage to the progeny: the divorce, or the prolonged intrafamilial stress which precedes divorce and which is made possible by longevity? To such questions no one has any right to answer either *ex cathedra* or out of preconceptions, since no one yet has objectively, carefully, and without passion or prejudice explored the influence of these complex psychosocial phenomena.

Let me illustrate other ways in which our thinking has been hobbled. We have assumed that parents are necessarily the best people to bring up their own children. Yet in earlier days when large families with many children and many adults lived under the same wide roof, responsibility for child-rearing was spread thin among the adults. Every child then had an adult ally to whom he could turn when needed, whether against his age peers or against any oppression by the adult group. Few children were "brought up," as today, solely by their inexperienced parents. The child does not have such an ally any more, unless arranged for him outside the family group. Instead, today's family is built like a pyramid, with all the intrafamilial rivalries, tensions, jealousies, angers, hatreds, loves, and needs focused on the untrained, vulnerable, insecure, young, inexperienced, and incompetent parental apex of this pyramid, about whose incompetence our vaunted educational system does nothing. It is, to say the least, foolhardy to take it for granted that this is a healthy way to bring up children. The issue merits objective investigation.

Longevity (an amazing achievement of modern medicine) puts on human ties still other strains never before experienced. For the average man his earning span has not increased, but, if anything, has diminished, while the number of older and younger dependents he must carry has increased. Moreover, the family (like most individual communities) is no longer a producing unit but only a consuming unit. This increases the rivalries and decreases the loyalties, the co-operative spirit, within the family, just as it does in the community. In this and other ways the family has become a source of economic and emotional insecurity instead of a source of strength. The center of security has thus shifted from the individual's effort to earn his own way to a sharing of risk through group insurance, social security, group health, union pension plans, etc. Consequently some remote impersonal agency (i.e., the government, the management, the union, the voluntary mutual insurance group) has taken over what was once a function of the parents, the clan, or the family. What are the effects on human development of replacing individual risk by group risk? What do all such changes do to the human spirit, and to the secondary and tertiary consequences of what is neurotic in all human nature?

Many other profound changes are at work in the family today. The shrinking size of the family unit creates new problems. The increase in population causes more people to live in smaller space. It is harder to smile politely every morning across an apartment-house hall at the neighbor who opens his door as you do yours than to greet such a neighbor once a month when you visit him five miles down the road. When he is that far away you do not have to pretend so often that you always feel like smiling at him. Congestion can reach a saturation point, a threshold beyond which the human spirit cannot breathe. This consideration, however, is singularly unimportant to real estate operators. The more human beings who can be crowded onto the point of an urban pin, the more money can be made, no matter what the cost to the human spirit.

Or take the profound change in the leverage of direct human responsibility for one another. This change results directly from the fact that in his life at home, at work, at play, and in government man has become increasingly detached from his fellows, increasingly faceless. Even on the battlefield, you shoot an enemy you cannot see and are shot by an enemy who cannot see you. In the labor union as in the industrial plant, working life is depersonalized by magnitude.

The home itself has become impersonalized, a place for sitting side by side, facing, not one another, but a ground-glass screen to watch imaginary catastrophes happening to someone else. All this creates a gap in what used to be the close-linked chain of human responsibility, a gap filled destructively by the impersonal monolithic structures of labor and industry, religion, states, "entertainment," and gangs—and monoliths are built on the destructive organization of rivalry, envy, acquisitiveness, hate, or fear.

Organized religion is deliberately included in this listing, since so much of the churches' strength rests on the organization, not of loving and individual responsibility, but of mass hating. We are rapidly moving into an era of choice between faith and the sword, forgetting that the right to believe as conscience dictates must include the right to question and doubt also as conscience dictates. Too often religion displays a strange fusion of hucksterism and evangelism, as in the substitution of the shopping list for the manger in our modern degradation of the Christmas festival.

In the meantime, as the entertainment industry and the advertisers take over, ours becomes a spectator culture. The increasing perfection with which the techniques of entertainment simulate reality increases our passivity. It requires a lesser effort of imagination to watch a television show than it once did to read a nickel novel. Nor is this transformation of our culture into a spectator culture attributable to the entertainment industries alone: the art dealers, picture galleries, couturiers, and decorators are all likewise involved.

Finally, we must consider our economy, increasingly gambling its success or failure on consumption by the installment plan. Has anyone since Veblen asked what would happen to such an economy if what is neurotic in human nature were by sudden magic to be eliminated? What would happen to the fashion cults, the beauty cults, the food and drink and tobacco cults with their exploitation of orality, the excretory cult, the cleanliness cults, the size cults, the height cults, the strip-tease cults? Consider the exploitation of hypochondriasis through the drug houses and even our more elite publishing houses. Take also the endless whetting of consumer cravings, the exploitation of the "gimmes" of childhood by transmuting them into the "gimmes" of adult life. Consider the ministering to neurotic needs through size and power: the knight of old has been replaced by Casper Milquetoast in General Motors armor, complete with chromium, unneeded size, unused seating capacity, and a pointless,

illegal, and unusable capacity for speed. Or consider the search for happiness anywhere else than where one is, and how the travel industry abets it by vacations on the installment plan.

To repeat, what would happen to our economy if we got well? And what does the exploitation of neurosis by so many forces in our culture do to the neurotic process itself? Is this a culture that breeds health? Is this a culture we can afford to be complacent about? Or have we allowed the enormous creative potential of private enterprise to be enslaved by greed to the neurotic process in industry, exactly as the creative process in art, literature, music, even science, has become the slave of neurosis?

Lest you think I am singling out our culture, our economy, for attack, I repeat that I do not believe that human ingenuity has yet devised any economic system that does not exploit, intensify, and reward much that is neurotic (potentially even psychotic) in human nature. If the profit-driven economies exploit subtle manifestations of neurotic self-indulgence and short-term needs, so do totalitarian systems, whether Fascist or Communist, exploit power needs and power fantasies in a still more primitive fashion, rewarding the sadistic lusts and the paranoid components of human nature. As Freud once pointed out, man is still frail enough to need competition for money and for conspicuous display as a buffering device with which to protect himself and his fellows from more brutal forms of the struggle for power.

The paradox here is that primitive cultural, political, and economic forms are inevitably transmuted into more sophisticated forms. But, because of the persistent influences of the masked neurotic forces in human nature, sophistication leads to its own weakening and self-destruction, so that the cycle returns to the primitive again. This is perhaps the most vicious cycle in the history of culture, and the one to which least attention is paid: namely, how the initial idealism of a totalitarian economy leads from the struggle for naked power, through perceptible transitions, back to the struggle for the glutting of personal yearnings. This in turn brings in the neurotic weakening of a profit-motive economy, and thence, through "The Degradation of the Democratic Dogma," [2] to self-destruction, and back once more to the primitive forms of power struggle. The world would be a safer place if on both sides of the Iron Curtain men would turn their attention to the ways in which each system sows the seeds of its own neurotic destruction. For these seeds of destruction can be eliminated only if we

recognize and attack the subtle, pervasive influence of the concealed neurotic processes in so-called normal men and women, who in their confused and immature and inept ways make up all human society, whether East or West.

Summary

1. Preventive medicine has always encountered obstacles that are rooted in socially entrenched prejudices. Preventive psychiatry must overcome obstructive forces even more tenacious than those now vanquished in other fields of medicine. These forces are built into social institutions, but have their deeper roots in the tendency of the neurotic process itself to resist change.

2. This manifests the basic fact that the neurotic process is interwoven with our growth processes and our highest intellectual and cultural aspirations, giving rise to a tendency to defend this all-pervasive aspect of the neurotic process as something to be prized, rather than disowned as something alien. Consequently the attitudes of the individual and of society toward the neurotic process differ materially from their attitudes toward other forms of illness.

3. We must attempt to prevent psychiatric disorders on three levels. (a) The organization of society in part determines the price we pay for our neuroses. Therefore certain elements of our social organization should be altered so as to alter the cost of the neurotic process, both to the individual and to society. In this connection, every phase of group living influences the fate of the neurotic process—economic differences, population density, longevity, housing, the organization of work and play, educational and religious processes, political and economic processes, the changing structure of the family, etc. Consequently, to limit the disastrous secondary and tertiary consequences of the neurotic process demands an objective consideration of every aspect of human society.

(b) Preventive psychiatry also depends on the earliest possible application of psychodiagnostic and psychotherapeutic methods. The adult neurosis and indeed the adult psychosis are in large measure the cumulative secondary consequences of the unresolved neurotic process of infancy. Therefore the early introduction of therapy constitutes one of the primary techniques of prevention in an effort to resolve the neurotic process so early and so completely that no residues remain to produce cumulative distortions in the maturing personality.

Our ability to do this depends first upon the sharpening and refining of our techniques of early psychodiagnosis, and second upon the training of a large number of experts competent to make early and precise psychodiagnoses and to give psychotherapy in situations not ordinarily reached by the psychiatrist. The training of a new profession, that of a doctorate in medical psychology, must therefore be an integral part of any all-out effort toward preventive psychiatry.

(c) The ultimate objective of preventive psychiatry, however, goes even deeper: it aims to limit or reverse the first steps in the neurotic process as these arise in infancy and childhood. To attain this goal will require much basic research to enable us to recognize those first deviations from the path of normal development which occur in childhood and which subsequently and in varying degrees influence every human life.

In our present stage of knowledge we can recognize several ingredients that require preventive manipulations: (a) a control of those experiences which impose on the infant persisting central emotional positions; (b) a control of those conditioning experiences which link these central emotional positions to trigger mechanisms; (c) a control of the processes of identification by which the developing personality makes destructive and conflicting identifications with destructive and conflicting persons; (d) finally and most important, there must be a significant measure of control of the processes of repression which produce a dichotomy in the symbolic process itself, i.e., the fateful dichotomy into conscious and unconscious components.

None of these goals is easy to achieve; but the recognition of their importance is a step forward. In coming years the course of preventive psychiatry will depend in part on the development of techniques aimed at these objectives.

4. A further complication is introduced by the fact that in some ways the most important part of the story of the neurosis deals not with an illness from which the patient himself experiences pain, but rather with concealed illness, which has a destructive effect on the lives of those around the patient and on society as a whole while leaving the patient relatively comfortable, at least until the neurotic process catches up with him in later years.

This is a strange fact, and one not generally understood: that the symptomatic neuroses which cause anguish to the patient himself usually cause less suffering to those around him than do those subtler

neurotic distortions of the personality which in our present culture we consider "normal." The latter are asymptomatic only in that they do not hurt the patient or betray themselves as easily recognized idiosyncrasies. Instead, they distort life itself, taking the joy equally out of work and play, irrespective of success or failure. They cheat men of the major share of their potential creative powers. They destroy happiness in sex, in marriage, and in parenthood. They are the origin of that most universal of all human ills, discontent. The ultimate goal of preventive psychiatry is to limit or even eliminate this. Yet precisely because these most universal of all manifestations of the neurotic process also cause the patient the least immediate suffering, they are the most difficult to bring into therapy or under control.

5. Psychotherapy (the attempt "to heal a man through the influence of his own mind," as Austen F. Riggs defined it) is part of the age-old struggle for freedom, especially the freedom to change. In contrast, psychonoxious processes enslave the human spirit. Thus the relationship of therapy to individual health parallels the relationship of political processes to the health of social structures; and the two relationships can be appraised along similar lines. Psychonoxious social forces intensify and perpetuate automatic, unthinking, uncritical repetitive trends in society. Psychotherapeutic social forces attempt to achieve for men in social groups the capacity to change and grow. Yet there is little in our culture, either in education, literature, art, music, religion, or philosophy, that is focused clearly on this goal. Too much of organized society is obsessed with a defense of entrenched and stereotyped forces of the past. Too little aims to free us from rigid neurotogenic mechanisms. The most searching test of the creative value of any ingredient in our culture is whether it increases man's capacity to change or entrenches his resistance to change. This might well become our ultimate criterion of "greatness," in whatever cultural field.[18]

This is yet another way of emphasizing the fact that what is psychologically ill in any individual is a product of that area of his life and personality in which his inner psychological forces are so organized as to predetermine the automatic repetition of behavior, irrespective of success or failure, reward or punishment, pain or pleasure. An increase in mental health (whether of man or society) implies an increased freedom from the domination of mechanisms that predetermine the stereotyped and automatic repetition of the past. For each individual this means freedom from the disproportionate influence

of unconscious processes. This is the ultimate goal of preventive psychiatry.[16]

6. There are complex technical issues and tough practical obstacles impeding the elimination of the roots of the neurotic process. The prevention of a process of illness which is integral with the processes of growth is technically, practically, even philosophically different from the prevention of those processes of organic illness which are engrafted onto normal development by some external accident or invasion. Learning how to grow up differently means learning to harness the subtle yet powerful forces which shape the development and the individuation of each human being and determine the emotional center of gravity in his life. These forces influence those acutely sensitive trigger mechanisms which explode his emotional responses and which above all influence the development of his most precious, his most creative, and his most vulnerable gift—the symbolic process. These constitute a challenge that fills one with awe and humility. The idea that we "outgrow" these difficulties without help, or that a happy home and an intact family are enough, or that better high schools, or more formal education, or love alone is enough; the muddled notion that believing is more creative than doubting, faith more powerful in advancing human culture than skepticism, the accepting spirit healthier than the challenging spirit—all these oversimplifications have been tried, and all have failed. As we face both the critical problems of the inner world and the devastating problems of the outer world, one asks whether we dare lull ourselves any longer with these ancient quarter-truths. Yet so lethargic has the spirit of our postwar American culture become, so craven in its demands for an easy answer to all tough problems, and so insistent on getting something for nothing, that I am again reminded of Henry Adams' comment on the complacency he found—the same complacency with which we approach most problems today. It is not in this spirit that we shall ever achieve the prevention of psychological ill health.

Let us now return to the question we asked at the beginning: is preventive psychiatry possible?

Unquestionably it is possible to alter materially the secondary consequences of the neurotic process, that is, to interrupt those social forces whose consequences reactivate the original process so that it builds up to greater tragedy. It is possible to ameliorate the sec-

ondary and tertiary manifestations of the neurotic process by changes in the shape of our society. Note that this is "possible"—"probable" is another matter. The least maneuver toward this goal requires an unsparing, critical re-examination of every element in our culture. If this is to be more than an empty intellectual exercise, it implies a willingness to experiment with changes in those elements in our social structure that reward, exploit, and thus intensify the neurotic process. Yet men live by their affiliation with institutions, and in turn the institutions themselves live by these various cultural stereotypes. It would be naïve, therefore, to imagine that changes can come easily in the face of strongly entrenched vested interests.

It is also possible (though technically more difficult) to alter the ways in which the individual human being develops, so as to gain a greater internal freedom for him. This means altering and guiding how he builds a unified sense of his own identity, how his emotional processes evolve, how the symbolic process matures, and how the neutrotogenic dissociation into conscious and unconscious systems occurs. These are critical steps in the development of the neurotic process out of the universal neurotic potential.

To pinpoint these as specific challenges for basic research on the techniques of prevention is an advance. But to turn the theoretically "possible" into an ongoing process toward a well-defined goal requires instruments we do not yet possess. In school, we need instruments of education based on self-knowledge in depth.[10] In the home, we require new techniques of child-rearing which will no longer reinforce the neurotic process as our homes do today. Our children need skilled adult allies outside the family circle, such as those who once graced every large household but who disappeared as the family unit shrank to its present sharply pyramidal structure. To this end the community needs prepayment plans for intensive education in the basic principles of child care and in the psychopathology of family living, plus periodic psychotherapy for parents and children.[6]

To develop such new devices will require many pilot tests, along lines elsewhere described in detail but never yet subjected to adequate experimental investigation. Though we have no ready panaceas, we can diagnose much that is wrong. This is worth doing, but only if it initiates uncompromising efforts to find better ways and better substitutes for many of our self-adulating institutions.

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The Impact of Science and Technology on International Politics

KARL W. DEUTSCH

DURING the last two decades developments in science and technology have brought about a striking transformation in certain aspects of international politics. These developments have changed the number of participants in the political game, the stakes of politics, and in some basic regards the nature of politics itself.

At the same time, technology has given rise to a succession of modern myths. Claims have been made, and sometimes widely believed, that invention and innovation are the monopolies of particular ideologies, social systems, or types of government. It has been asserted that technology has made, or is currently making, governments omnipotent, and that it is thus removing previous limitations on the powers of dictatorship. It has been repeatedly claimed that technological change has decisively shifted power from the many to the few, and this claim has been made with respect to a wide variety of technological changes. We have been told that modern technology, when applied to war, will not only favor attack as opposed to defense, but will also put a particular premium on the blitzkrieg and the surprise attack.

Most of these assertions are false to a large degree. To state the correct case—or such elements of it as we are in the process of finding—is more difficult, and may require a rethinking of some of our basic concepts, even of some of the very words we have been using in discussing international politics. We may have to take a new look at the concepts of political power, of national interest, of political identity and the processes by which men align themselves with

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national or international groups, institutions, and symbols. Concerning this ongoing process of the revision of some of our basic concepts, no more than a sketchy interim report can be offered here, and any implication as to current problems of national security and foreign policy should be considered as equally provisional.

The Overestimation of the Scientific and Technological Prowess of One's Own Nation or Culture

All over the world, governments have tended to claim specific national and ideological credit for the acceptance of technological innovations in their own territory, even if these have originated abroad. The foreign origin of these innovations is then usually concealed from the population. This happens by casual omission oftener than by deliberate design, but the result is the same. "All great inventions are French," declared a poster issued by the French Minister of Education in the 1930's. Most American school children do not know that the automobile was originated by a German, or sulfa drugs by another German, or penicillin by an Englishman. The trade names of many foreign synthetic fibers are changed before they are marketed in the United States. The same is true, of course, of most other countries; for example, the emphasis on national scientific prowess in Soviet Russian publicity has attracted world-wide attention. The results in all large technologically advanced countries are much the same: an overestimation of national inventiveness and ability to innovate, and hence of national technological and scientific power, coupled with a systematic underestimation of the scientific and technological capabilities of foreign countries.

Scientists themselves are by no means immune to this effect. A study of a fairly large sample of American scientific journals shows that at the beginning of the century American scientists were citing about two foreign sources for every reference to an American publication. By the early 1950's they were citing on the average about three American sources for every foreign one. This general trend has held for foreign journals published in English as well as those published in other languages. American scientific contributions rose during the same period, but the ratio of national attention to our own "national" science consistently tended to remain four times as high as the ratio of national scientific contributions to foreign ones. Since the ratio of contributions was taken from an American publication, *Chemical Abstracts,* whose editors had presumably selected

articles with an eye to the interests of their predominantly American readers, the lead of the attention ratio over the contribution ratio might have been higher if an international or foreign source of abstractions had been used.[1]

The Overestimation of Partial Military Innovations

Related to this almost inevitable element of excessive self-estimation is a tendency to overestimate the immediate military value of single technical innovations and to conceive of winning "lightning wars" with the help of "miracle weapons," just as the Germans believed in the blitzkrieg and the *Wunderwaffe* in World War II.

In actual fact it appears that no great war during the last century has been won by the sudden introduction of a radically superior weapon by one side. Such weapons or weapons systems have indeed been introduced with considerable surprise and with dramatic effects —most often, however, by the country that eventually lost the war. It was the Confederacy that launched the ironclad ship *Merrimac* that was supreme for a day. It was the France of Napoleon III that used a new type of machine gun, the *mitrailleuse*, against the Prussian armies in 1870. It was the Germans who introduced the heavy siege guns of the Big Bertha type in 1914, who first used poison gas with dramatic effects in 1915, and who opened large-scale submarine warfare. In the Second World War, Germany pioneered with the new weapons system of the dive bomber and the tank in 1939; it led with pocket battleships and packs of submarines breathing through new snorkel tubes; it was first to commit jet fighter planes to battle; and it was first to use long-distance rocket weapons such as the V-1 and V-2. A related case, not one of a radically new weapon but of a highly effective surprise tactic, was the successful Japanese attack on Pearl Harbor; it, too, was followed by the defeat of the power that had so effectively launched it.

In none of these cases was the introduction of new weapons sufficient to win the war. Within a short time the new weapons were paralleled or balanced by similar or complementary weapons on the other side. The general and long-run capabilities of the contending countries, governments, or national economies turned out to be more decisive than the short-run advantages in committing a relatively small amount of new weapons to action.

One of the basic reasons behind this process has been formulated effectively by Samuel P. Huntington.[2] The ratio of *lead time* (the

time needed to develop a new weapon or weapons system) to *use time* (the time during which it can be employed before being matched by a similar or complementary weapon on the other side), says Huntington, is growing ever smaller.[3]

In other words, it takes longer to develop a new and ever more complex weapons system. In civilian research it has been estimated that fifteen years on the average elapse between the first patent given for a new major invention or innovation and its practical introduction on a large commercial scale. In the case of the Manhattan Project, the first suggestions for a large-scale effort were made in 1939, and a crash program produced three atomic bombs by the summer of 1945; one was exploded at the test site at Alamogordo and the other two over Hiroshima and Nagasaki. The dropping of these bombs over Japanese cities without previous warning was justified later on the grounds that no further bombs of this kind were expected to be available to the United States until late in the year. The actual time, therefore, from the conception of atomic bombs to their availability in quantities large enough to make them effective against a major opponent, who, unlike Japan, was not already at the breaking point, would presumably have been at least six years.

The periods of monopoly in the new weapons, however, have tended to get shorter. Russia produced nuclear explosives, according to United States official announcements, within about four years after 1945. The Americans led the Russians in producing the first hydrogen bomb explosion by about one year. In the case of the hydrogen-lithium bomb, Russia has been alleged to have been in advance of the United States; if so, her lead was again extremely short. More recently, in the case of globe-girdling space satellites, the Soviet lead time over the United States was approximately fourteen months, while the preparation of the necessary rockets in both countries took several years. If these experiences count for anything, they seem to suggest that no matter which country is first in the production of some new weapon, other countries on a comparable level of scientific and technological development will match it with corresponding productions of their own, well before the first country will have had time to develop its new weapons and delivery system to such levels of quantity and reliability as to be militarily decisive.

This is even truer of the second half of the twentieth century, when weapons of mass destruction have already become so varied and so plentiful in the largest countries that they cannot be wiped

out by any single blow. Under these circumstances a surprise blow could work vast destruction but could not possibly prevent similarly devastating retaliation from scattered, concealed, or otherwise surviving facilities or bases. At the present levels of technology, nothing can protect the main population centers of a country engaged in all-out nuclear war. Moreover, attackers can usually think somewhat earlier of a new method of delivering their weapons than the defenders can think of methods of intercepting all of them. It seems likely that at any future level of technology at least some of the attacking nuclear weapons would reach the main population centers. At the same time, it seems unlikely that any future form of attack with nuclear weapons or other means of mass destruction could count on knocking out all facilities for a counterblow.

The Overestimation of Surprise

Under these conditions the much cited value of surprise may become far less than has been thought. Rather, the greatest likelihood of survival may go to the country that has the greatest facilities for waiting before considering itself attacked and before launching a return blow from properly prepared facilities.

Soon the major countries of the world will have sufficient nuclear weapons to kill all or most of the inhabitants of the major population centers of the enemy, and they may retain this ability for saturation killing, regardless of any surprise attack to which they might be subjected. In such cases the only effect of great speed in retaliating or in launching the first blow by any power would be to replace saturation killing of the enemy population by "over-killing" them—to use a characteristic mid-century addition to the language. While the speed of attack or retaliation would affect the number of casualties in nuclear warfare short of the level of saturation capabilities (provided effective provisions had been made for civil defense), little or no effect of this kind could be expected from speed or surprise, once saturation capabilities existed in ample measure on both sides.

The position can be put in somewhat more analytical language. Let us call two well-armed countries X and Y. If the weapon-launching facilities of X, concealed from or otherwise unidentified by Y, comprise among them a saturation-bombing capacity with respect to country Y, even the most successful surprise attack by an aggressor Y against the known industrial and weapon-launching targets of coun-

try X would contribute nothing to Y's chances for survival in a reprisal attack launched by X. On the contrary, by provoking retaliation from the surviving weapon-launching facilities of the attacked X, Y would only provoke X to a saturation bombing of Y, including Y's known industrial, weapon-launching, and civilian targets, thus drastically reducing or wiping out Y's chances for survival.

Clearly, the critical variable is the capability of the concealed, dispersed, or otherwise unknown launching facilities of X, relative to the saturation bombing level of Y, particularly of Y's main cities and industrial districts.

The probability that enough cities, industries, and masses of population could be protected or concealed so as to ensure national survival can be dismissed as too small to matter in the foreseeable future. By the very nature of the operations, they are much harder to protect or conceal than are mere rocket-launching sites. In view of the increasing power and performance of nuclear devices, the undetected weapon-launching sites of a country X will far more likely tend to be near or above the number of capabilities requisite for the saturation bombing of Y than will the undetected industrial and civilian targets of Y tend to be anywhere near the level requisite for national survival.

With the capabilities of the concealed launching system of X near saturation level, any "preventive" or surprise attack on the known bases or industrial targets of X would be worse than useless for the aggressor Y. It would merely court his extinction by provoking a saturation counterblow.[4]

The Overestimation of Small Military Elites and of "Limited Nuclear Warfare"

Just as the belief in surprise tends to an overestimation of the importance of single events as against that of long trends and of large groups of events, so a related belief has asserted that modern technology has irretrievably shifted power away from the many, in favor of the few. Here technological images have provided a succession of rapidly changing stage properties for the current dreams overestimating the importance of elites.

The main theme of these daydreams has remained almost entirely unchanged. A small group of highly trained professional soldiers equipped with the latest miracles of technology are to do away once and for all with the military importance of mass armies, "nations in arms," or "armed hordes," or other forms of mass participation in

military matters. Such small and highly trained forces, the dreams run on, will find it easy to police wide stretches of territory inhabited by large numbers of superstitious natives, who can easily be frightened into submission by the terrifying superiority of the new type of hardware used by their rulers. The tank and airplane were thus to become the weapons of a new aristocracy in the 1920's in the writings of such military theorists as Generals J. F. C. Fuller and Giulio Douhet; the highly professionalized Reichswehr of General von Seeckt was to make mass armies obsolete. In the same decade the propeller-driven airplanes and small conventional bombs of the Royal Air Force were to preserve order and stability throughout the Middle East.

All these theories collapsed in the event. Germany's small professional armies were merely the core of the mass armies of Hitler's Reich. In the end, World War II was won by a coalition that included the largest mass armies and the greatest extent of mass participation in war efforts that the world had seen. In the 1950's the Royal Air Force showed no more ability to stabilize the politics of the Middle East than did the French armies in maintaining French power in Indochina. In the Korean War, the North Korean attack was contained and driven back, not by a small elite of highly trained professionals, but by a mass effort of American and South Korean soldiers.

Yet the old vision has not lost its appeal. Its latest version is the theory of limited atomic war recently explored by a study group of the Council on Foreign Relations, which included such able and imaginative thinkers as Lieutenant General James M. Gavin, formerly of the United States Air Force. The findings of this group have been ably summarized and vigorously presented by Henry A. Kissinger, whose book I cite:

> The tactics for limited nuclear war should be based on small, highly mobile, self-contained units, relying largely on air transport even within the combat zone. The units should be small, because with nuclear weapons firepower does not depend on numbers and because a reduction in the size of the target will place an upper limit on the power of the weapons it is profitable to employ against it. The units must be mobile, because when anything that can be detected can be destroyed, the ability to hide by constantly shifting position is an essential means of defense. The units should be self-contained, because the cumbersome supply system of World War II is far too vulnerable to interdiction. The proper analogy to limited nuclear war is not traditional land warfare, but naval strategy, in which self-contained units with great firepower gradually gain the upper hand

by destroying their enemy counterparts without physically occupying territory or establishing a front line. . . .

The ultimate aim should be units which carry to its conclusion the analogy between limited nuclear war and naval strategy. Since the mobile units will not be able to rely on a logistics system of the traditional type, they should be able to carry all their supplies and maintain their own equipment.[5]

This is the apotheosis of the "elitist" concept of war. The tanks and supporting vehicles, plowing their way through the countryside of friend or foe, need to take as little account of the political sympathies of the local population as naval units would of the political opinions of fish. It would be a different question, however, how long such a force could go on without local intelligence, how easily it could be deceived or lured into ambushes and traps, and how vulnerable its vehicles would be to small, easily carried, and easily concealed land mines, mortars, or bazookas.

Mr. Kissinger is fair and realistic in stating the political limitations of these tactics. He says:

Small mobile units with nuclear weapons can be extremely useful for defeating their enemy counterparts or for the swift destruction of important objectives. They are not an efficient means for establishing political control. The Hungarian revolution of October and November 1956 demonstrated the difficulty faced even by a vastly superior army at attempting to dominate hostile territory. The Red Army finally had to concentrate twenty-two divisions in order to crush a practically unarmed population. No such concentration is feasible in a nuclear war. Nuclear units of high mobility should, therefore, be used to make the countryside untenable for the invader. They should be supplemented by stationary defensive positions in deep shelters, immune to any but direct hits by the largest weapons.[6]

Here the implied assumption becomes clear: in reality, the effectiveness of limited nuclear warfare may stand or fall with the political sympathies of the local population. Mass sympathies and mass participation may bring success either to a police force armed with nuclear weapons or to rebels and guerrillas who have acquired similar collections of small, "clean," portable nuclear equipment.

Recent efforts to produce ever smaller, "cleaner," and more easily portable atomic weapons will thus not necessarily produce any shift in military power favorable to the West. The wide introduction of the sub-machine gun did not increase the effectiveness of the police force

in Chicago in the 1930's. During the Second World War, sub-machine guns eventually became at least as effective in the hands of the guerrillas as in those of regular troops. If small atomic weapons undergo a similar process of "conventionalization," they will eventually become similarly diffused, and on the day local guerrillas in a dozen primitive countries have as ready access to an atomic bazooka or an atomic mortar as they now have to sub-machine guns and hand grenades, life at police headquarters and other centers of authority in these regions will become precarious indeed. The small conventional nuclear weapon intended to defend some existing state of law and order may well turn out under certain conditions to be a significant step toward revolution or widespread anarchy. Such centers of authority may have to remain stable and visible in order to fulfill many of their tasks and thus they may not easily be converted to an imitation of guerrilla tactics. The more popular side in a civil war has a relative advantage in maintaining mobility, dispersal, and concealment, so that small nuclear weapons may worsen the position of unpopular aristocracies or colonial regimes.

On this point, too, Mr. Kissinger's arguments are open to grave doubts. He seems to believe that the Western powers—presumably the United States above all—are peculiarly fitted for the dispersed and decentralized tactics of limited nuclear war, and that the Soviet Russian force and their Communist allies in other countries are not. He writes:

> In a limited nuclear war dispersal is the key to survival, and mobility the prerequisite to success. Everything depends on leadership of a high order, personal initiative and mechanical aptitude, qualities more prevalent in our society than in the Soviet bloc. To be sure, the Soviet forces can train and equip units for nuclear war. But self-reliance, spontaneity, and initiative cannot be acquired by training; they grow naturally out of social institutions or they do not come into being. And a society like that of the Soviet Union, in which everything is done according to plan and by government direction, will have extraordinary difficulty inculcating these qualities.[7]

It is somewhat surprising to read these arguments and the references to the rigidity of certain Soviet army instruction which are adduced in their support, and to notice that Mr. Kissinger seems to have given no weight to the well-known record of Communist use of dispersed military tactics and of guerrilla warfare in World War II and thereafter in China, Indochina, and Korea. His argument about

the alleged lack of initiative of Soviet unit commanders, presumably even in guerrilla situations, sounds deductive rather than empirical:

> Self-reliance cannot be improvised. It exists in the American officer corps because it is drawn from a society in which individual initiative has traditionally been encouraged. By the same token these qualities will be difficult to realize in the Soviet armed forces because nowhere in Soviet society can models for them be found. Where everything is done according to plan, there may be a tendency to reduce even initiative to stereotype.[8]

This bolsters the illusion of the effectiveness of small elites with another illusion discussed earlier: that certain systems or ideologies are seen as having a monopoly of technical competence, in this case of self-reliance and initiative. In view of the actual behavior of Communist guerrillas (Russian, Chinese, and others) as well as the self-reliance and initiative presumably required for recent Soviet scientific and technical achievements, the whole argument has a faint air of bygone days.[9]

The Overestimation of the Capabilities of Dictatorship and of Highly Centralized Political Power

A final image still belongs to this same family of notions—the image of government made omnipotent by some advances in the art of electronics. "Big Brother" in George Orwell's *1984* was watching people through a television camera in every bedroom. Electronic listening devices have been pictured as recording all conversations everywhere.

These images are based on a misunderstanding of the nature of communication, which in fact is dependent upon channels of limited capacities. It is easy to mechanize communication output and to relay the same speech or advertisement to millions at the same time. But it has proved well-nigh impossible to mechanize attention. If Orwell's "Big Brother" had ever tried to listen to the millions of irrelevant conversations recorded by his microphones, he would have lost his mind. The most any government or police could do would be to examine a small sample of the information recorded by its electronic gadgetry, and every scanning device of this kind is likely to prove highly ineffective, particularly after its limits become known to the population.

The experience of wartime letter censorship seems to bear out this

point. Censorship was maintained with limited success in countries where the governments and their policies had popular support, such as the United States, but it was far less effective in the hands of unpopular regimes, such as the German occupiers in France or Yugoslavia in World War II.

Recognition, like attention, cannot be easily mechanized. At best an electronic gadget could recognize an image or a pattern of speech previously stored in it specifically for such a purpose. It could not recognize anything new beyond the fact that it was new, or at least different from what had been stored in the gadget. The human mind, on the other hand, is essentially and incurably combinatorial. It puts things together in new ways and thus makes ever new patterns from the pieces of the old. No government or machine can predict what all the new combinations will be, nor could they be prepared to recognize them. Even if a particular combination could be suppressed at one particular time and place, nothing in a world of combinatorial minds could prevent its recurrence. This is one of the fundamental limitations of dictatorship, which no amount of technological progress is likely to abolish.[10]

Another, and related, limit of dictatorship is the problem of communication overload. The more a government is burdened with messages from a restless population it must supervise, the less time its leaders have to pay attention to messages from abroad apprising them of the activities of other countries. If they succeed in keeping up with all the reports on foreign affairs as well as on home-front morale, they must still be able to pay attention to messages apprising them of the loyalty of their own policemen, bureaucrats, and soldiers. The larger the country or empire, the harder will it be for its rulers to keep up with all these messages.

To put it more generally: the larger a nation grows, the more difficult it becomes for its rulers, its general elite, or its broader, politically relevant strata to pay sufficient attention to the needs and desires of the populations of outlying regions, and of the governments and peoples of allied states. Any improvement in transportation and communication, far from reducing this problem, is much more likely to increase the communication overload at the center. What the engineer knows as the scale effect thus applies in the field of social communication. Borrowing a phrase from economics, we might call this a tendency toward the declining marginal responsiveness of large organizations.[11]

While many writers have drawn attention to the ability of technology to foster the integration of smaller political units with larger ones, very little attention has been drawn to the opposite process, which seems to be at least equally present in technological development: the tendency toward self-insulation on the part of large states and highly centralized governments, with their susceptibility to scale effects and communication overload, and their eventual tendency to lose their ability of assimilating additional units, which is followed in extreme cases—such as that of the Austro-Hungarian Empire—by their tendency to break up again into smaller parts. One may therefore say that in the study of large-scale political centralization and integration, too, some steps from myth to reality have yet to be taken.

Wanted: A Reanalysis of Some Basic Concepts

It is easier to point out misunderstandings as to the role of modern technology than to suggest positive interpretations. Before such positive interpretations can be carried out, much work will have to be done. What has been said already about overloading the attention of governments, of elites, and of electorates, suggests the need for a reanalysis of the old concept of national interest. The relative self-insulation of large political communities has a striking effect on relationships of power among states, as these have been traditionally understood. And if "political interest" refers to a concentration of attention upon an expectation of a result—whether this expectation is realistic or not—then it becomes clear that the concept of national interest should be reanalyzed from the viewpoint of communication. Similarly, if results consist in external events valued by the decision-maker, as well as in internal events in his own mind such as would permit him to hold onto cherished past habits or beliefs, then it again appears that the interest of overburdened decision-makers may shift toward maintaining or defending their own state of mind rather than toward discerning rewarding opportunities in the real world around them.

Political power has been defined by a distinguished theorist of the "realistic" school as the control exercised by one mind over others.[12] A more analytical approach by Harold Lasswell and Abraham Kaplan defines power as participation in decisions involving severe sanctions.[13] Somewhat reminiscently of Jeremy Bentham's calculus of pleasure and pain, Lasswell and Kaplan seem to suggest that the behavior of persons or groups can be controlled by manipulating the

ratio of indulgences to deprivations in relation to each major course of action open to them. The actors, it is implied, will be attracted by the rewards of indulgences offered, and they will be deterred by the prospect of penalties or deprivations.

Large modern states, however, may not be easily moved by promises or threats. Once internal politics has determined a course of action, no set of external messages may be able to change it—any more than the temperature readings recorded in the ship's log proved capable of stopping the rush of the *Titanic* toward collision with the iceberg. No message from the United States government proved able to stop the southward plunge of the North Korean armies in June 1950, nor did any message from the Chinese Communist government succeed later in the year in stopping the northward plunge of General Douglas MacArthur's forces across the thirty-eighth parallel.

At the extreme of this trend, large states might become insensitive to any warnings or to any stimuli comparable to pleasure or pain, indulgences or deprivations, short of a total war which would destroy them. Such an extreme outcome seems unlikely, though by no means impossible. Its mere possibility suggests, however, that the classic conceptions of power should be again analyzed in the light of the communications processes through which alone can "power" in the classic sense be perceived, as well as the processes of communication, control, and self-control without which such "power" cannot be applied.[14]

Some Implications for Policy Alternatives

Such a reassessment of some of the basic concepts of our thinking about foreign policy might lead eventually to an alternative program for promoting the national security of the United States and of its principal democratic allies.

It would certainly not be a policy of one-sided disarmament. The purpose of our policy is to preserve the Western way of life and its defensive strength, not to abandon it. But it should be a policy that works—one that effectively preserves the Western countries and their way of life, instead of merely hoping or pretending to preserve them by an unrealistic reliance on a misunderstood technology. Such a realistic and effective Western policy would pay far more attention to the winning and holding of genuine popular support for the West in areas where we are in competition with Soviet influence, and such a policy would be perhaps less ready to accept as inevitable our pre-

sumed lack of man power—that is to say, mass support—in many of these regions. It would be a policy of opposition to the hasty spread of nuclear weapons to additional countries, such as Western Germany, and of preference for our own assumption of such strategic defense in this area as might be necessary.[15]

In weighing the conflicting claims of messages upon the attention of decision-makers, we might have to make special efforts to accord more adequate relative priority status and weight to messages originating from outside our national self-system, and generally to information about the state of the outside world and the needs, initiatives, and aspirations of its inhabitants. We might require a foreign policy more sensitive, perceptive, and responsive to our international environment, a policy somewhat less dominated by past habits, by an unwillingness to accept the reality of changes in the outside world, and by a proneness to steam ahead to the very brink of collision.

To improve our prospects for the future, we shall have to look for sources of political motivation and national effort other than the violent stimulus of a perpetual military state of near-emergency. We have been told that only the specter of a relentless "cold war" or an immediately imminent crisis in foreign affairs can elicit from the United States Congress and from public opinion the support and sacrifices necessary to conduct any effective foreign policy at all. In the same view, the Soviet Union can maintain its level of economic and political effort almost regardless of anything that happens to the climate of international politics. Hence any relaxation of international tension is said to confer a competitive advantage on the Soviets and to hurt the position of the West. This whole view needs to be re-examined, and the careful exploration of every feasible step toward a limitation of the international arms race should be considered with particular care—precisely for its possible contribution toward the national interests and the national survival of the United States.[16]

In its positive sense, let us think of a program of strengthening the democratic world at its core, beginning with the urgent problem of restoring the annual rate of economic, industrial, and technological growth in the United States to a level well above that of the years 1952 to 1959, when we were so conspicuously losing ground relative to the more rapid growth of Soviet output.

Strengthening the Free World at its core also means a concentrated

effort in regard to the economies of certain key countries, such as the United Kingdom, India, France, and perhaps Italy, Pakistan, and Japan. Equally or more important is an attempt to change the scale of the major political unit of the Western world: the nation-state. If a substantial advance toward a closer pluralistic political community could be achieved between the United States and Britain, or among the six members of the European Coal and Steel Community, or among the powers on the Western European continent and the English-speaking countries, this would signal the beginning of a new and creative response to the challenges of technological and scientific change.

Altogether, the impact of science and technology may well shift our attention to the political conduct of our foreign affairs. It will require a great deal more than mere "political warfare" with its almost inevitable connotations of propaganda and of the attempted manipulation of the "audiences" to whom it is directed. In the coming years there will be a premium, not upon political warfare, but upon political leadership, political responsiveness, and the ability of the Western world to identify itself with the needs and aspirations of the large majority of mankind. The age of thermonuclear weapons may well have made obsolete the famous statement of General Douglas MacArthur to the effect that there is no substitute for military victory, and it may have replaced it by the proposition that there is no substitute for international perceptiveness, political mass support, and economic growth.

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WORK IN PROGRESS

The Pastoral of the Self

RENATO POGGIOLI

I

NO READER of *As You Like It* is likely to forget the double repartee by which Shakespeare wittily closes the lively exchange between two characters of that comedy, either of whom stands for a peculiar version of the pastoral ideal:

> *Jaques.* I'll tarry no longer with you. Farewell, good Signior Love.
> *Orlando.* I am glad of your departure. Adieu, good Monsieur Melancholy.

If Shakespeare calls *Monsieur* the gentleman who hails a loveless solitude as the supreme grace of pastoral life, and *Signior* the one who blesses that life for its power to join two lonely hearts together, it is only because the Christian names by which the poet had already baptized the two speakers are the French Jaques in one case and the Italian Orlando in the other. Yet it is difficult to treat as a mere coincidence this naming of the representative of the erotic pastoral as Signior Love, since the main business of the Italian poets of the late Renaissance, especially Tasso and Guarini, had been to reduce the manifold variations of the idyllic fancy to the common denominator or single archetype of the pastoral of love.

As You Like It ends with a rather Pyrrhic victory of Signior Love over Monsieur Melancholy. Yet one could say that one of the tasks of European seventeenth-century literature was to reverse that outcome: or, to speak less metaphorically, to liberate the pastoral from that excessive or exclusive concern with passion and sex which had shaped the bucolic vision of the Italians. The writers of that age succeeded in doing so first by taking up its neglected variants, such as the pastorals of melancholy and solitude, which they developed in either contact or contrast with the Italian example; and then by creating a novel variant, such as the pastoral of the self, which in the end transcended all previous traditions of the genre. The achieve-

ment of this double task was the particular merit of a few masters of the literatures of England and Spain: and from this viewpoint Shakespeare would have done better if instead of a French he had given an English or Spanish name to his Jaques, and addressed him as *Sir* or *Don* in lieu of *Monsieur*. One should, however, never forget that the ultimate representative of the pastoral of the self was bound to be another and less fictitious Jacques—the greatest literary figure of the eighteenth century, Jean-Jacques Rousseau, who wrote in French, and who would certainly deserve being called *Monsieur Soi-Même*.

Yet in a process such as the one to be described, what count most are the preliminary and transitional stages. The text that best documents the opening phase may well be the story that forms the climax of the most important of *Don Quixote's* bucolic interludes. That story, based on the conflict between the pastoral of love and the pastoral of solitude, ends with the victory of the latter, which for the first time is represented not by a shepherd, but by a shepherdess. Since the Spanish word for solitude is feminine, one could then say that in this case it is *Doña Soledad* who conquers *Signior Love*.

II

We enter the main "pastoral oasis" of *Don Quixote* at the end of Chapter X of the First Part, when Don Quixote and Sancho, suddenly surprised by darkness while still in open country, decide to spend the night outdoors, in the company of a group of goatherds. Thus with the traditional motif of peasant hospitality Cervantes opens the chief bucolic episode of his masterpiece. The travelers have just shared the simple fare of their hosts when a lad by the name of Pedro, whose job is to bring provisions for his fellow goatherds, comes from the village and relates to his companions and their guests that a gentleman farmer of a neighboring village has just died and has left a strange will. From Pedro's report, which is devoid of any logical order, and even more from his answers to Don Quixote's searching questions, we learn that the dead man, named Grisóstomo, had been young, handsome, and rich. He had studied at Salamanca, from where he had brought home great learning as well as the art of writing poetry. Shortly after his return, Grisóstomo had lost his father, who had left him property in land and cattle, in goods and cash. In the goatherds' village there was a girl named Marcela, no less handsome and young than Grisóstomo, who had also lost her parents, although

earlier in life, and had inherited from them even greater wealth. She had been brought up by her uncle, the village priest, a good-natured old man who had never tried to force her resolute will to marry no one. But one day, without changing her mind, Marcela did change her way of life, in a manner best described in Pedro's words:

> But, lo and behold, when we least expected it, the modest Marcela suddenly appeared dressed like a shepherdess and, in spite of her uncle and everyone in the village, who tried to dissuade her, off she went into the fields with the other village shepherdesses and started to tend her flock.*

Grisóstomo and Marcela are the two leading characters of the pastoral fable we are about to be told: and it may well be worth while to examine how far they have now satisfied the stock requirements of their roles. They certainly seem to do so in full: Cervantes has endowed both of them with the supreme pastoral privileges—beauty and youth. If the author bestows on them even the blessings of class and wealth, which pastoral poetry at its most literal treats as parallel curses, it is only because, like many of his recent predecessors, Cervantes tends to relate the pastoral calling to the moral and social status of the landed gentry, and wishes to emphasize that such a calling appeals to those who are poor "in spirit" rather than in fact. This is obvious enough: yet Cervantes avoids attracting any attention to the outstanding divergence of his own story from the stock pastoral situation. It is true that literary shepherds are often born outside the pastoral state, into which they enter by an act of will, or at least by imitating the action already taken by someone they admire or befriend. In this case the divergence, almost without precedent in the whole of pastoral literature, is seen in the fact that the willing or unwilling leader, the person taking the initiative, or at least setting an example, is a woman and not a man. Now we know that in the pastoral story we are about to hear there will be, not simply two leading characters of different sex, but an antagonist and a protagonist, which is extravagant enough; and we also know that by an even more extraordinary exception the latter will be a feminine one.

By the way he talks we realize that the simple-minded Pedro takes it almost for granted that quite a few wealthy and well-born youths, whether boys or girls, may turn into shepherds at a

* All Cervantes passages are reprinted by permission from *Cervantes: Don Quixote*, translated by J. M. Cohen, published by Penguin Books, Inc., 3300 Clipper Mill Road, Baltimore 11, Maryland.

moment's notice. Yet he cannot help finding it strange that at least some of them may do so for other than erotic motives. It is through Pedro's wonder at this deviation from the normal path that Cervantes betrays his awareness that he is now straying far away from the central vision of the Italian Renaissance idyll, according to which any pastoral retreat is a retreat into love, or at least into love's dream. As we know, the latter alternative occurs in the "pastoral oasis" of Tasso's *Gerusalemme Liberata*, which Cervantes must have kept well in mind while writing these pages. That famous episode deals with Erminia's stay among the shepherds. While Erminia is a passive heroine, Marcela is an active one: she decides to become a shepherdess forever, after refusing all her old suitors and without even thinking of new ones. What is wholly novel is that Marcela, unlike Erminia, changes her pastoral retreat into a retreat from both the reality and the dream of love. It is with due emphasis that Pedro points out this fact:

> Now you mustn't think that because Marcela adopted this free and unconstrained way of life, with little or no privacy, her modesty or her virtue had fallen under any shadow of suspicion. Far from it; she guards her honor so well that no one of her many suitors has boasted—nor has the right to boast—that she has given him the slightest hope of obtaining his desire.

The ironical consequence of Marcela's decision is that by acting as she did, she was bound to win all the hearts of her fellow shepherds without ever losing her own. This is why all of them had been calling her cruel and unkind: and no one had blamed her so harshly as the late Grisóstomo, who had finally died out of despair as soon as he realized that Marcela would never change her friendship into love. Although Pedro fails to say so, it is evident to everybody that Grisóstomo had put an end to his life by his own hand. If a reader asks for proof, he should be referred to the shepherd's request to be buried elsewhere than in consecrated ground. The discretion with which Cervantes alludes to all this is perhaps to be explained by theological considerations: we must never forget that the character was born a Christian, and that the author wrote in an age of religious dogmatism and fanatic zeal. Yet, besides being a Christian, Grisóstomo was a shepherd too, and any reader well acquainted with the pastoral tradition will immediately realize that his suicide is a literary transgression as well as a mortal sin. One could convey the sense of that transgression by anachronistically defining Grisóstomo as the

first and last Werther to appear in the pastoral world. In brief, within the economy of the bucolic genre, Grisóstomo's suicide is no less arbitrary and unique than Marcela's decision to become a shepherdess in order to deny even more fully the rule of love.

The reader senses as much from the very tone of Pedro's words:

> . . . . and the strange thing is that he has directed in his will that he's to be buried in the fields like a Moor, at the foot of that rock where is the spring of the cork tree, because, the rumor goes—and they say they had it from his lips—that it was the spot he saw her for the first time. He has left other requests, such odd ones that the clergy says they mustn't be carried out; and quite right so, because they have a heathenish smack about them.

The narrator further relates that, all this notwithstanding, Ambrosio, who had been Grisóstomo's best friend, has stated his intention to fulfill his duty and do everything according to his poor friend's wishes. Pedro ends his report by informing his listeners that the following morning all his fellow shepherds will bring Grisóstomo's spoils to the spot he had chosen for his eternal rest. Hearing this, both Don Quixote and the goatherds decide to attend the ceremony.

Ambrosio, who is in charge of the proceedings, pronounces a funeral eulogy, and announces that he will burn his friend's manuscripts, as he had promised. Yet another fellow shepherd, Vivaldo, takes one of the dead man's papers containing one of his poems, and reads it aloud to the crowd. This poem is a *canción desesperada* in an extremely conventional style: and the effect of its reading over the grave of the man who wrote it is both absurd and grotesque. There is no doubt that by this and other details Cervantes wants to suggest to the reader the unseemly character of the funeral we are now witnessing. The strange obsequies of the shepherd Grisóstomo are devoid not only of Christian reverence but of pagan piety as well. It is only when Vivaldo is about to read aloud another of the poems left by the dead man that the scandal is interrupted by an unforeseen event. This was, as Cervantes says,

> . . . a miraculous vision—for such it seemed—which suddenly appeared before their eyes. For on the top of the rock in which they were digging the grave appeared the shepherdess Marcela, looking even more beautiful than she had been described.

As soon as Ambrosio sees Marcela, he wrathfully calls her "fierce basilysk of these mountains," and reproaches her for adding

scorn to injury by her presence. To which Marcela replies that she has come only to defend herself from the accusation that she is responsible for Grisóstomo's suffering, and that she had caused his death. Marcela's long peroration begins with the acknowledgment that beauty inspires love, but also with the denial that it must return the love it inspires. The reason for this is not only that beauty is a grace which is granted without exacting the price of any responsibility toward others. What really matters is that such a grace disappears unless beauty involves the spiritual as well as the physical side. Without such adornments of the soul as modesty and virtue, loveliness cannot reside even in the most beautiful body. By yielding to man's desire, woman loses the very charms by which she attracts him. Having made these points, Marcela proclaims her moral independence in pastoral terms:

> . . . I was born free, and to live free I chose the solitude of the fields. The trees on these mountains are my companions, the clear water of these streams my mirrors; to the trees and the waters I disclose my thoughts and my beauty.

Marcela affirms that she has always undeceived by her own words those attracted by her looks, and maintains that if love for her led any man to his undoing, it was the fault of his obstinacy rather than of her supposed cruelty. To Grisóstomo himself, when he declared his love for her on that very spot, far from beguiling him with false hopes or flattering promises, she had unequivocally stated her decision to lead a solitary existence, in communion only with nature and her own soul:

> . . . I told him that my will was to live in perpetual solitude, and that only the earth would enjoy the fruit of my chastity and the spoils of my beauty.

Marcela ends her speech with an eloquent plea, picturing the pastoral calling as a state by which the soul attains its ideal perfection and purity:

> . . . If I preserve my purity in the company of the trees, why should he who would have me keep the company of men desire me to lose it? I, as you know, have riches of my own, and covet no one else's. I have a taste for freedom and no wish for subjection. I neither love nor hate any man. . . . I enjoy the modest company of the village shepherdesses and the care of my goats. My desires are bounded by these mountains; and if they extend beyond them, it is to contemplate the beauty of the sky, a step by which the soul travels to its first abode.

Everybody is both moved and astounded by the speech of Marcela, who leaves the scene as soon as she has uttered her last word. As for Don Quixote, acting as if Marcela were a damsel in distress, he puts his hand on his sword hilt, forbidding all present to follow or persecute her, and loudly proclaiming the justice of her argument and the righteousness of her cause. After this the funeral rites proceed according to plan, including the burning of Grisóstomo's manuscripts. Before leaving, Ambrosio announces that later he will replace the rock by which they have sealed the grave with a tombstone to be engraved with a rhymed epitaph he has already prepared. That epitaph will claim forever, as if nothing had happened, that his friend had died because of his beloved's disdain, or, as Ambrosio puts it, of *desamor*. By such an ironical ending Cervantes seems to intimate the persistence of the bucolic illusion, or the persistent refusal on the part of its devotees to heed the lesson of life and to face the challenge of death.

In brief, what counts in the story is not Grisóstomo's illusion, which is at once sentimental and literary, but Marcela's spiritual and personal truth. And we find it significant that this shepherdess preaches her creed by exalting values directly opposed to those exalted in *Aminta's* first chorus. If Tasso preached sexual freedom, Marcela preaches instead freedom from love. If Tasso condemned honor, which enforces chastity and purity and makes both men and women unhappy by preventing the free play of love, Marcela praises honor, chastity, and purity as the highest of all pastoral virtues. Yet in doing so she changes those virtues into something strangely new. For her, honor is no longer a social tie controlling moral conduct from outside, but an inner power ruled by no other law than itself. Chastity and purity are not the exterior signs of the ethical will, but spiritual manifestations of the integrity of the person, of the perfection of the soul. It is then by a total reversal of the pastoral casuistry of love that Marcela brings forth what seems to be one of the earliest versions of the pastoral of the self. While affirming the lofty values of the latter, she denies, however, something higher than mere bucolic love. The erotic idyll is a masculine dream: "disappointed hedonism" may often lead a rejected swain to misogyny, to that hatred for the female which is but love for woman turned sour.

Marcela seems to avoid the pitfalls of sexual hatred by her proscription of sexual love. This is what she means when she proudly states that she neither hates nor loves any man, or when she simply

acknowledges that the most she can offer to any other human being is but a casual fellowship, to which she prefers the silent company of nature or the soul's intercourse with itself. Friendship is not a substitute for charity: and Marcela's way of life may well imply a denial of the Christian command to love, as well as of the pastoral one. An excessive concern with selfhood ends all too often in self-love: and no other detail proves this as eloquently as the fact that Marcela attends Grisóstomo's funeral merely because it is also her trial. If she comes, it is not to pay the tribute of pity at the grave of a dead friend, but to use that grave as a tribune from which to plead the cause of the self.

That plea attains its climax in Marcela's avowal that there is neither love nor hatred in her heart. Yet such an avowal reveals that, while refusing to imitate the male hating the female who fails to respond to his love, Marcela cannot avoid the far worse pitfall of misanthropy, which is the negative complement of concern with the self. Now, both self-love and misanthropy are perhaps the most important components of the pastorals of melancholy and solitude. All too often self-love dons the mantle of purity, while misanthropy garbs itself all too easily in self-righteousness. If the latter is primarily an ethical disguise, the former is predominantly a religious mask. If this is true, then we cannot take too seriously the claim Marcela makes at the end of her speech, when she says that one of her life tasks will be that heavenly contemplation which initiates a mortal's soul into its immortal bliss. It is obvious that Marcela's mysticism carries an impurity and a worldliness of its own. Before that single, final allusion to the contemplation of heaven, she has spoken far more extensively and eloquently of the contemplation of nature, which she considers the most suitable mirror for reflecting the beauty of her own soul. In brief, not unlike the devotees of Eros, she treats her far less carnal but no less profane passion as if it were a form of sacred love.

III

There is a short English lyric which is a document of no lesser importance in the history of the Baroque pastoral than the long Spanish prose tale on which we have just commented. That text is Andrew Marvell's *The Garden*, which deserves an intensive analysis, not only for its significance and quality but also because the poem's brevity contributes to the complexity of its statement.

The Garden opens with a Baroque conceit by which the poet turns to his advantage the gnomic commonplaces of the pastoral of innocence, especially those indicting the social passions of vanity and ambition. How frequently and intensely does man exert himself (complains the poet rhetorically) to win the palm of the warrior, the oak of the statesman, the laurel of the poet, or the "single herb or tree" which is the symbolic reward of his efforts! Yet, as Marvell sententiously observes, the shadow projected by those leafy emblems of fame is far less lasting and lovely than the one produced by a grove where all plants join together to weave not coronets of glory but "garlands of repose." The only place where such a grove can be sought is the garden into which the poet has just withdrawn from the weariness and dreariness of the world. There he has found not only the two lovely sisters who are the fairest of all nymphs, peace and innocence, but also their sacred plants, which, unlike the symbolic flora of man's vanity, belong to the real vegetation of this earth. It is in their midst that the poet is now enjoying a solitude more delightful than the most tender or refined fellowship:

> Fair quiet, have I found thee here,
> And innocence, thy sister dear!
> Mistaken long, I sought you then
> In busy companies of men.
> Your sacred plants, if here below,
> Only among the plants will grow.
> Society is all but rude,
> To this delicious solitude.

Up to the second stanza of his poem Marvell treats his own withdrawal into the garden as a flight from society. But in the following stanzas he claims that the main motivation of his escape is to find rest and relief from the labors and sorrows of love. Later, by using jointly the devices of personification and paradox, he describes his own retreat from love as if it were Love's retreat from itself:

> When we have run our passion's heat,
> Love hither makes his best retreat.

Since he has chosen to convey the positive, novel experience of sexual abstention and renunciation under the imagery of the withdrawal of love, Marvell has no other alternative but to depict his own

stay in the garden as Love's successful attempt to find there new and different objects—not fair women but "fair trees," whose beauty far exceeds that of his sweetheart. The lover of woman has turned into a lover of trees: and when indulging in the pastoral pastime of engraving their trunks, the letters he inscribes will not evoke or invoke any absent womanly being, but merely spell out the names by which those trees are known.

Having thus changed his love objects from human creatures into botanical ones, the poet compares himself to those gods who pursued a maid or a nymph only to see her transformed into a flower or a plant. Marvell builds this comparison into a striking anticlimax: reversing the meaning of the fables to which he refers, he treats the botanical metamorphosis by which they end as if it were a consciously expected or willfully provoked outcome: the fulfillment, rather than the frustration, of the god's desire. In brief, if a god persecuted a maid or a nymph, it was only because he wanted to see the creature he loved metamorphosed into a vegetable being:

> The gods, that mortal beauty chase,
> Still in a tree ended their race.
> Apollo hunted Daphne so,
> Only that she might laurel grow.
> And Pan did after Syrinx speed
> Not as a nymph, but as a reed.

It is at this stage that the poet finally discards the imagery of love, but only after drawing a last comparison between nature and woman, which is, in regard to the latter, an invidious one. The poet now looks not at the individual plants but at the whole grove, at the impersonal mystery of vegetation, at a landscape completely submerged in the anonymity and unanimity of the coloring which dominates the vegetable kingdom and the life of the earth. Yet at its first apparition the poet cannot help contrasting nature's dye to the tints of woman's complexion; and he insists that nature's color is more lovable than the hues of feminine beauty, which are the colors of love:

> No white nor red was ever seen
> So amorous as this lovely green.

In the lines that follow, any erotic suggestion, even of a negative kind, seems to disappear forever. The subject's passive and passion-

less contemplation of the garden's greenery seems now to abolish any other substance or appearance,

> Annihilating all that's made
> To a green thought in a green shade.

Here the poem reaches its critical point, and seems to anticipate some of the tendencies of the modern mind with its all too morbid wish to merge with the world soul or sink into mother nature's womb. Yet the two preceding stanzas prove that Marvell still thinks in conventional pastoral terms, as is shown by the sudden metamorphosis of this all too Italian garden—not into an English park, but into an orchard offering its juicy fruits for the asking to the joy of man. Both figuratively and literally, nature here remains all too fenced in: while its boundless fertility requires no human labor, its beauty, as shown by the closing vision of the flower bed which a "skillful gardener" has laid out in the shape of a sundial, may still need the artifices of man's wit and the control of his hand. Yet it is precisely as *hortus conclusus* that nature becomes the best abode of the soul. If in the golden age or in the Earthly Paradise of yore man could proudly wander abroad in the splendid nakedness of his body, here he may dwell or linger outdoors in the luminous pure nudity of his spirit:

> Here at the fountain's sliding foot,
> Or at some fruit tree's mossy root,
> Casting the body's vest aside,
> My soul into the boughs does glide.

At this point, as if to make it move and abide at greater ease among the boughs, the poet changes his soul into a bird. The metamorphosis is more metaphoric than symbolic: and since the image does not become *figura,* we should not conclude that this bird is the dove of the spirit. Marvell's awareness that the emblem he is using was originally religious in essence appears in the allusion to the "longer flight" the bird-soul will undertake when its stay in this or other gardens comes to an end. Yet such an allusion is to be taken even less literally than Marcela's closing reference to that "contemplation of heaven" by which the soul prepares itself for its final ascent. That Marvell's is a bird of different feather than the one standing for the Christian soul is shown by its main concern—to groom its gorgeous

plumage and make it shine like a rainbow in the changing light. Except for its small size, we would at first think this feathery creature a peacock. Later we realize that this could not be so for other reasons. The peacock, after all, is barely able to fly, which our bird can easily do, although at present it prefers to rest in the garden, perching on one of its trees. There, with no thought of flying away, with no other care than delighting in its own beauty, it sings aloud, as no peacock can do, of its newly found bliss. Far from being an allegory of the religious soul, which trains itself through contemplative life to fly back to its eternal abode, Marvell's bird stands for an all too human and personal psyche, which retreats from the world of society into the world of nature so as to be less distracted from the bemused contemplation of its own loveliness:

> There like a bird it sits, and sings,
> Then whets, and combs its silver wings;
> And, till prepared for longer flight,
> Waves in its plumes the various light.

By nursing and reflecting its beauty within the intimacy of a nature so enclosed as to become a private reserve, the soul changes its own hermitage into a sort of outdoor boudoir. In literary terms, this simply means that at such a turning point the pastoral of solitude gives way to the pastoral of the self. While the former rejects man's love for woman, the second repudiates all love for any object other than the subject itself. This is the reason why at the poem's end the poet looks back at pastoral love. By that retrospective glance he wants to deny the old dispensation more fully and definitely than he has done before. The poet succeeds in doing so by changing the temporal perspective, by making the new dispensation the older of the two. While in the earlier stanzas he had treated the withdrawal of the self into the garden as an event occurring after the extinction of passion or the consummation of desire, now he views that withdrawal as a happening that took place in the remotest of all ages, when love had not yet made its appearance in the world.

In brief, the poet likens his own retreat to man's state in the Garden of Eden before the Fall, thus suggesting that pastoral innocence existed from the beginning of life itself. Marvell goes even further: to establish a perfect equation between the pastoral of solitude and the pastoral of the self, and to make both of them absolutely, rather than relatively, independent of the pastoral of love, he compares his

own *hortus conclusus* to the Garden of Eden as it was, not simply before the Fall but before the very creation of Eve:

> Such was the happy garden-state
> While man walked there without a mate:
> After a place so pure, and sweet,
> What other help could yet be meet!
> But 'twas beyond a mortal share
> To wander solitary there;
> Two paradises 'twere in one
> To live in Paradise alone.

As the closing lines intimate, Marvell faces here the very issue Cervantes avoided by choosing a maidenly heroine as protagonist of his tale. Unlike the Spanish writer, the English poet builds the pastoral of the self on the cornerstone of misogyny, as well as on the more general foundations of misanthropy. Marvell the moderate puritan knew, as Milton did, that woman is a necessary evil, and that not even in Paradise will man ever live alone. Yet here he seems to think that the dream of a pure and sweet solitude may be realized within space and time, if we measure the former within the narrow range of an orchard or garden and reckon the latter within the brief span of the day, the hours of which are symbolized by the "herbs" and "flowers" of the botanical sundial appearing at the end of the poem. Marvell's acknowledgment that pastoral bliss can be only a momentary experience is made almost without regret, since the pastoral of the self must transcend that contrast between happiness and unhappiness which is at the very root of the pastoral of love. This is the reason why Cervantes ignored the tragicomic implications of the Marcela-Grisóstomo story or why Marvell neglects the very dialectics Milton has exemplified in his famous diptych, *L'Allegro* and *Il Penseroso*. Melancholy and solitude are one and the same thing; and the soul is at once pensive and mirthful when it keeps its own rendezvous with itself.

IV

By rephrasing a line by Dante one could say that according to the traditional Christian view the blessed, and the blessed alone, are *anime fatte belle*, and that it is God who makes them so. On the contrary, Cervantes treats his Marcela, and Marvell the birdlike psyche he celebrates in *The Garden*, as souls which have been born beautiful or have been made so by no other grace than an inner one. Then,

at least potentially, they are already *belles âmes* in the sense that term will definitely acquire in eighteenth-century France, particularly in the hands of Rousseau. Actually Rousseau's *belle âme* is emancipated even more than are Cervantes' and Marvell's exemplars from the residual controls of the mind and the will. This is particularly true of his two main psychological archetypes, who are the Saint-Preux of *La Nouvelle Héloïse* and the autobiographical protagonist of the *Confessions* and the *Rêveries d'un promeneur solitaire*. Despite his claim to be the friend of mankind, the author of those works based his own conception of the *belle âme* on an almost hypochondriac misanthropy. Yet if he refused to sweeten that misanthropy with the balm of friendship, he also refused to embitter it further with the harsh medicine of misogyny. The task he had set out to accomplish was, after all, to bring back passion as the chief ingredient of the bucolic vision of life: the test of a *belle âme* was for him an uninterrupted effusion of feeling, overflowing and overwhelming all its vessels and objects.

In brief, Rousseau re-established and reinforced the broken tie between the pastoral of love and the pastoral of the self. This explains his youthful admiration for such an old-fashioned pastoral romance as *Astrée*, of which he speaks at length at the beginning of the *Confessions*. This also explains his love for Italian poetry, testified by the frequent quotations from Petrarch, Tasso, and Metastasio to be found in *La Nouvelle Héloïse*, as well as his passion for Italian music, especially for the opera, which in his time was but an idyll in courtly dress. It was by turning back to the Italians that Rousseau reintroduced into the pastoral the concern with sex, which he fused with the concern with the self. Sexual love is but a form of self-love, and in the *Rêveries*, when left without a sexual object, Rousseau found that object within himself. It was only with him that the pastoral of the self turned once and for all into the literary vehicle of an extreme and absolute narcissism, replacing the fables and myths of his Renaissance predecessors with the autobiographical and introspective concerns of modern literature. Rousseau transformed Narcissus, literally and unambiguously, into Jean-Jacques, as other and later poets, no longer committed to pastoral traditions and conventions, were to transform him into their Werthers or Renés. And the external mirror within which this new Narcissus would reflect his *belle âme* would no longer be a garden or an idyllic countryside, but a nature as wild and boundless as the romantic view of the self.

REPUTATIONS

The Political Philosophy of Jacques Maritain

CLARENCE MORRIS

The Socialization of Man

POLITICAL THEORIES about the origin of the state fall into two major classes. The social-contract philosophers, stressing purposive forces, say the state is rooted in the consent of the governed. Political theorists who are better grounded in anthropology picture ethnic grouping and emergence of elites as a slow, organic, little-planned process, a process in which national character is unique, indigenous, and intuitively adaptive.

In his *Man and the State*,* on which this examination of his political philosophy is largely based, Jacques Maritain subscribes to neither position to the exclusion of the other. He agrees that some groups more or less happen; that tribes and clans coalesce without much forethought and expand into larger communities; that communities of communities become nations. He further agrees that there is some merit to the argument that each ethnic group should respect its spontaneously developed customs and should rely on its vital unconscious strength and empirical practical wisdom.

But, as a neo-Thomist, Maritain is committed to believing in free will. His view that man can and should plan his political organizations is not only an article of metaphysics; populations that listen too reverently to their national promptings, he believes, adopt disastrous programs of arrogant nationalism or make unwise claims for fragmenting self-determination.

Maritain (in the ancient Aristotelian and modern psychiatric tradition) recognizes man's natural need to belong, to live in groups, to be organized, to be accepted. In his view political society is not artificial; it results from man's nature—it is never pure reason, though reason may influence and advance its particular forms. The state,

* Chicago, University of Chicago Press, 1951. All the quotations from Maritain in this article are taken from that source.

however, is instrumental or purposive in the sense that "putting men at the service of that instrument is political perversion. . . . Man is by no means for the State. The State is for the man." The state's primary duty is social justice. It must do much more than keep peace and order and enforce private rights. It must launch large-scale public works and plan their progressively decentralized operation; it must stimulate private organizations to function autonomously and yet in coordination with one another and with state enterprises. Ideally the spontaneous grass-roots activities of private groups will promote the common good so that the function of the state can be confined to mere supervision and umpiring, but current "backward general conditions" have imposed a heavy burden of social justice on the state until such time as it is able to stimulate private groups to enhance social justice with little outside help or interference.

Maritain asserts, without citing data or authority, that the state is awkward and injudicious in business, art, and science because it is too remote from concrete social existence. He would tolerate state intervention in these fields only when the social consequences of *laissez faire* are unbearable. Even those who do not agree may still admit that this point of view widens the search for social justice; perhaps in the twentieth century we turn too readily to government for social justice—without trying to marshal private forces for good. Yet Maritain sees with a prophet's eye (not a scientist's) when he pictures society's goal as follows:

> The final step would take place . . . when prodding by the state would no longer be necessary, and all organic forms of social and economic activity, even the largest and most comprehensive ones, would start from the bottom. . . . from the free initiative of and mutual tension between the particular groups, working communities, cooperative agencies, unions, associations, federated bodies of producers and consumers. . . . Then . . . the state would leave to the multifarious organs of the social body the autonomous initiative and management of all the activities which by nature pertain to them.

Only one who believes beyond the evidence can hold that these hopes are likely to be realized.

Social Values

Their Origin and Function; the Nature of Ends

A society that is purposive has values. Especially on their theories of values are neo-Thomists and pragmatists usually thought to be at

odds. A comparison of contrary views often throws light on each. It appears profitable, therefore, to discuss Maritain's value theories in the context of John Dewey's.

Dewey disaffirms man's need for fixed goals of conduct chosen in advance of action. This is his definition of the *ends of conduct:* they are foreseen consequences taken into account in problem-solving deliberation; they finally stimulate the deliberator to act by furnishing an adequate reason or motive for going ahead. Therefore, he says, ends arise from action and function through action; they do not lie beyond conduct and shape conduct from outside. At first glance it seems that Dewey would reject Maritain's basic social-value premise, which is that the final aim and essential task of the body politic is to better conditions of human life, e.g., to advance the common good so that everyone may reach the independence proper to civilized life. This goal seems to be a "fixed end beyond activity at which we should aim"—an example of the kind of theory of morality that Dewey condemns.

But note: Dewey doesn't say conduct is not in fact often predetermined. He says that impulse and habit are primary determinants of conduct. Nor does Dewey say men should not use what they have learned about how to reach desirable ends. On the contrary, he pictures men as learning how to act in some such fashion as this: men throw—at first instinctively or in natural reaction to some situation. They see the results of throwing, which then takes on a new meaning. Henceforth, throwing-men think of their act in terms of its probable results. In so doing they act intelligently, they have an end; they take aim; they find or make targets to aim at. This, says Dewey, is the origin and nature of goals in action. Dewey deplores the stubborn adherence to ends rather than their use for what they are worth. He says:

> When ends are regarded as literally ends to action rather than directive stimuli to present choice they are frozen and isolated. . . . Set up as complete and exclusive [an end] leads to narrowness; in extreme cases fanaticism, inconsiderateness, arrogance and hypocrisy. . . . One reminds one's self that one's end is justice, or charity, or professional achievement or putting over a deal for a needed public improvement, and further questionings and qualms are stilled.*

* John Dewey, *Human Nature and Conduct,* New York, Modern Library, 1930. All quotations from Dewey are taken from that source.

Maritain's basic social-value premise does not so operate. One would not act arrogantly and inconsiderately if he were in fact concerned with bettering human life or advancing the common good so that each concrete person might reach the independence proper to civilized life—unless he justified evil means as likely to produce this end.

On the subject of proper means, however, Dewey and Maritain are in agreement. Dewey says that common sense rejects the saw about the end justifying the means—that overlooking the means disregards evil consequences, which, when noted, estop action. Compare Maritain's statement:

> . . . the means must be proportioned and appropriate to the end, since they are *ways to the end,* and, so to speak, the end itself in its very process of coming into existence. So that applying intrinsically evil means to attain an intrinsically good end is simply nonsense and a blunder.

Dewey might have said that Maritain's basic social-value premise is a vague, pious hope likely to inspire us to chant its words but unlikely to evoke concrete efforts toward its realization. Dewey says that the course of formulating aims begins typically with a wish bedded in distaste for some aspect of the present, and with a hope for something better. If action fails to realize this hope, it may project itself in an imagined scene that promises satisfaction. The picture is often called "an aim" or more often "an ideal," but it may be only a castle in the air; it becomes a functioning aim only when concrete conditions for its realization are worked out. Dewey concludes, "The great trouble with what passes for moral ends and ideals is that they do not always get beyond the stage of fancy . . . based on an emotional wish." Yet if Maritain is not dreaming but is indeed offering concrete programs for ameliorating actual inhumanities of our times, the suspicion of vague idealism is unwarranted.

Natural Law

The theme of Natural Law has many variations. Neo-Thomists have largely rejected seventeenth- and eighteenth-century versions; they take their basic theories on Natural Law directly from Aquinas himself, who in his time built on those of Aristotle and Cicero.

Maritain analyzes Natural Law under two heads. First he concerns

himself with Natural Law as it really is (the "ontological element"). He says:

> . . . there is, by the very virtue of human nature, an order or disposition which human reason can discover and according to which the human will must act in order to attune itself to the essential and necessary ends of the human being. The natural law is nothing more than that. . . . Natural law is an *ideal order* relating to human actions, a *divide* between the suitable and unsuitable, the proper and the improper, which depends on human nature or essence and the unchangeable necessities rooted in it.

So far Maritain sounds much like the medieval Aquinas. Saint Thomas saw that man in society needs legal direction he cannot get from the Natural Law, which yields only abstract and broad principles. But Maritain more than Aquinas stresses variations in the concrete facts of life, which perhaps loom larger in the twentieth century than they did in the thirteenth. Maritain says:

> Human situations are something existential. Neither they nor their appropriate regulations are contained in the essence of man. . . . They ask questions of that essence. . . . An angel who knew the human essence in his angelic manner and all the possible situations of man would know natural law in the infinity of its extension. *But we do not.* [Italics mine.]

Maritain continues with his second basic element: the Natural Law as known (the "gnoseological element") as distinguished from what it really is. Aquinas' Natural Law is self-evident, at least to those wise enough and learned enough to see it. Maritain says that men can know Natural Law only imperfectly, and therefore they run the risk of error. "The knowledge which our moral conscience has of this law is doubtless still imperfect, and very likely it will continue to develop and become more refined as long as humanity exists." To Maritain, then, Natural Law and knowledge of Natural Law are two different things. Only in so far as it becomes known and "expressed in assertions of practical reason" does Natural Law have any binding force.

In sum, then, Maritain can hold his Natural Law theory and yet not seek predetermined ends fanatically and at all costs. First, his Natural Law is not mechanically applicable to novel situations; and second, he knows the doctrines of Natural Law in imperfect formulations that can be gropingly reformulated as he becomes wiser. This sounds like the defense often made for the pragmatic wisdom of the adaptive development of the common law.

Maritain's Natural Law differs in one regard from the common law: it stays on a high level of generality—too abstract to represent anything but the widest doctrines of a functioning legal system. However, Maritain supplements it with two other forms of working principles, the *jus gentium* and the *positive law*. The *jus gentium* in Maritain's jurisprudence is less abstract than Natural Law, but is somewhat general; it represents helpful thought about the pervasive problems of the times. Positive law gets down to grips (using whatever working guidance it can get from Natural Law and the *jus gentium*) with the specific local problems of a particular government. But even positive law in Maritain's system of politics may be too abstract, too removed from concrete exigencies to deal with the problems at hand. Remember that we earlier observed that Maritain despairs of the ability of government to solve the problems of business, art, and the sciences, because of the remoteness of government from the facts involved. So Maritain, like Dewey, challenges ends that are too abstract. He adds another fear to that of Dewey: an end that is too abstract may, in Dewey's estimation, inhibit action; such an end, Maritain believes, may touch off action that prejudices the common good. Maritain's prescription for avoiding dreaminess and impracticality is to leave problems and suggestions for solving them (whenever possible, with justice) to those unofficial associations most directly interested and therefore best informed and most likely to act, and to act properly.

At the outset of his theory of Natural Rights, Maritain recognizes certain absolute and inalienable rights—and again seems to be setting frozen goals compelling action, regardless of side results. But once more he retreats from inflexibility. These rights, he says, are liable to limitation, "not as to their possession, but as to their exercise." For example, the right to education is absolute and inalienable, but subject to the resources of a given society; that right cannot with justice be universally claimed if its recognition would impair the body social. This, however, does not nullify the right; the right to education should spur on a concrete effort toward social change that will make its satisfaction possible. In so far as that right is a dream, then, Maritain would have it a dynamic, inspiring dream rather than an enervating, placating one. Dewey, too, believes in programs promising desired results. For example, he applauds Kant's Categorical Imperative as "an ally for impartial and sincere deliberation and judgment." Perhaps Maritain's right to education is a similar

(though more specialized) tool—a reminder that enlightenment can be the ally of reason in promoting an ability to think impartially and sincerely.

Dewey says (while picturing how dissatisfactions can give birth to aims) that a wish becomes an aim only when worked out under concrete conditions promising its realization. This transformation happens only when a study of conditions leads to the discovery that the desired result already exists in some form. A fancied delight in flying became an actuality only after men studied the way that birds, though heavier than air, sustained themselves in flight. "A fancy becomes an aim when some past sequence of known cause-and-effect is projected into the future, and when by assembling its causal conditions we strive to generate a like result."

Thus men's aims, as distinguished from their dreams, grow like science, pure and applied. But one of the great mysteries of science is the source of its hypotheses. Much is known about the logic of scientific verification; little is known about the art of developing new scientific truths. Certain kinds of useful devices are group inventions, sometimes produced almost unconsciously. This is the way language usually grows. To some extent our morality (usages, customs, mores, group self-images, and ideal patterns) has grown the same way. The "historical school" of philosophers were so impressed with the vitality and adaptiveness of such inventions that they feared other sources of programs of social control. Maritain shares that fear only to a limited degree.

There is a constructive side to Maritain's theory of moral growth. Science has a history of proliferative development; discoveries and advances are all built on prior discoveries and advances—Galileo builds on Tartaglia and Benedetti, Newton on Galileo, Einstein on Newton. The enterprise Science becomes a less coarse, more corrected, more detailed body of knowledge as time goes on. And this is true even though contributors to scientific advance differ widely in their aspirations, their methods, and their views on the acceptability of virtually all new scientific theories. Perhaps the unifying element in scientific advance is that verification develops a consensus. But this unifying force flowing from the approved logic of verification has little to do with the volume of the production of hypotheses to be tested.

Maritain seems to draw an analogy between the consensus reached by science and the consensus of the civilized world on any concrete

program for human betterment. "It is doubtless not easy but possible to establish a common formulation . . . of the various rights possessed by man in his personal and social existence." Such a program is envisaged as the development of concrete means and the study of their actual consequences. What Maritain then makes explicit has gone largely unsaid, in both the philosophy of science and the philosophy of morals: that hypotheses must somehow emerge from a prescientific cultural matrix. He says:

> Systems of moral philosophy are the product of intellectual reflection on ethical data that precede and control them and reveal a very complicated type of geology of the conscience, in which the natural work of spontaneous, pre-scientific, and pre-philosophical reason is at every moment conditioned by the acquisitions, the servitudes, the structure and evolution of the social group. Thus there is a sort of vegetative development and growth, of moral knowledge and moral feeling, which is in itself independent of the philosophical systems, although in a secondary way the latter in turn enter into reciprocal action with this spontaneous process.

Maritain goes on to say that, as a result, theoretical moral differences flourish even after practical rules of conduct are settled for a given time and a given culture. So, he concludes, from a sociological viewpoint, "Moral progress . . . is the experiential development of awareness"—in other words, moral advance is made when testable proposals for advancing the common good seem worth testing and prove both practical and meritorious.

Maritain, however, does not limit moral growth to the practical. His (religiously inspired) respect for man's ability to improve his knowledge of the good leads him to posit an inevitable growth in subjective morals. He denies man's ability to give an a priori picture of "those genuine inclinations . . . rooted in man's being as vitally permeated with the preconscious life of the mind" because they develop as mankind learns and are evinced by the history of human conscience. Maritain has said earlier that moral conscience will become more refined throughout mankind's history. This optimistic prophecy of the development of subjective conscience is of course an article of faith, not an extrapolation of the known facts. We know more about the good than we once did; the record of what has been tried and how it works becomes longer and more accurate. But Western society has not yet demonstrated that it has or will become incapable of atrocity.

Freedom and Political Organization

Maritain, it will be remembered, has said men are organized in two ways—in more or less natural, unplanned groupings and in intentionally organized associations. Even groups as large as nations can be natural communities of communities; they become bodies politic only when intentionally organized and humanly structured. Membership in a body politic is in some sense consented to. Like Rousseau, Maritain uses the concept of a "social compact" to depict what society ought to be, rather than to legitimate or limit the authority of those in power. Democratic bodies politic should require their citizens to embrace the tenets of a society of free men. These tenets make up a "secular faith." Maritain calls this faith "practical," by which he means that it is consistent with many varying philosophies and religions but does not require citizens to hold any special philosophy or religion. He sees such a body of tenets as covering virtually every aspect of modern political life with some degree of specificity. A society holding this faith can see itself as a promoter of the common good. It is less corruptible than those nineteenth-century democracies which lacked the "*common faith*" that could have enabled them to resist disintegration.

Non-agreers—political heretics—should be opposed by strong political action. If and when non-agreers resort to illegal violence, they should be checked by state authority, acting always justly and according to the law. Maritain does not believe as does John Stuart Mill that free speech corrects mistakes and promotes truth and political progress. Yet Maritain fears restrictions on free speech because they are likely to impede protection of freedom and imperil defense of the common charter and common morality. Like Spinoza, Maritain says the suppression of free speech does not work: ideas are not abolished by banning their utterance; totalitarians silence dissidents not by suppressing their ideas but by killing them. The state, however, should not be burdened with judging whether or not expressions are heretical; it should interfere only when tangible acts threaten the democratic charter or when money for antidemocratic propaganda is received from a foreign power. Education and counterpropaganda check subversion better than does suppression.

Maritain insists on representative government. Like Locke, he sees representatives as servants of the people and as responsible to them. But like Aquinas, Maritain has reservations as to the people's

political perceptiveness and steadfastness. Therefore he requires representatives to act in accordance with their own consciences rather than to bow to public clamor. These representatives should educate and awaken the constituents they serve; they should not give in to people momentarily distracted from their own aspirations. This educative function is quite different from selling ideas to the public. It enlightens, it does not curry favor. Thus public officials (who according to Maritain are inevitably inept in matters of business, art, and science, and who should delegate such matters to private associations) must of necessity possess special aptitudes in affairs of government. They must be the tutors of the people and must act according to their own consciences. When in their view a need for governmental participation in business, art, or science arises, Maritain's political philosophy gives officials a red and a green light at the same time.

An interesting facet of Maritain's theory of the state is the place he gives to "prophetic shock minorities." A healthy democracy needs not only a sound constitutional structure, but also energy—dynamic adaptive movement. Times change but governments remain stable—and rigid. Officeholders seldom welcome disruption. But the health of the body politic on occasion calls for disturbers like the fathers of the French Revolution, or Tom Paine, Thomas Jefferson, John Brown, to galvanize society into forward-looking action.

The danger is that a disturber will turn out to be a false prophet. Maritain gives some identifying characteristics of such false prophets: they propose significantly serious illegal activity; they terrorize the innocent; they are unwilling to submit their proposals to popular approval when the liberated people can express their true will. Democracy can and will protect itself against false prophets, if the democratic faith is strong and widely held. But that faith prospers only when fostered by the "inner energy of . . . civic morality in the people themselves, the enjoyment by them of real freedom in their everyday life and of a truly human standard of living, and the active participation of them in political life from the bottom up." One of the weapons for the self-protection of democracy, Maritain reiterates, must be freedom to criticize. Democracy is so armed only when the press is free, not only from state interference but also from economic bondage.

Maritain does not look with equanimity on the disruption wrought by shock minorities; he hopes for a utopia in which this "sad

necessity" will be obviated by a mature democracy whose prophecies issue from the people themselves, out of the regular life of the body politic. Here again we meet Maritain's faith in the adaptive powers of unofficial society operating at the grass-roots level to which justice must penetrate.

Conclusion

Maritain deals at length with two topics not discussed in this paper. His Chapter VI on Church and State develops a theory of the Christian inspiration but not the control of the body politic, with its morality, justice, friendship, and common good rooted in Christian awareness. He does not, however, call for theologic answers to political questions that might impair the common good; civil law, he believes, should adapt itself realistically to promoting that good of which the multitude is in fact capable.

Maritain's last chapter in *Man and the State* deals with world government. Truly democratic intrastate forces may curb drifts toward absolutism in national governments. The international community, however, is remote from warm individual insistence on democracy, and must cope with the organized and personified sovereignty of states. Hope for a world society confronts towering obstacles; the idea of world society implies a world-wide equalization of living standards, calling for a moral heroism for which we are badly prepared. A proper world society, like proper bodies politic, should be pluralistic and much decentralized, and yet it must be strong enough to cope with state sovereignties. A sense of the universal common good must be developed and must supersede the sense of the common good of national bodies politic. This sense will not develop before world government is set up; it will be a product of world government; but some beginnings of a pervasive sense of world friendship must lay the groundwork.

Maritain's essay is a powerful one. Without disregarding our growing knowledge of the obscure forces that pull men together, Maritain insists that government and other forms of group life should be as rational and experimental as possible. His theory of ends calls for our keeping an eye on means, and this in turn requires a scrutiny of all consequences. His theory of Natural Law freezes ends less than do most Natural Law theories, first by denying to anyone a perfect knowledge of Natural Law, second by stressing the great variety of facts about which Natural Law, as such, contains no truth,

and to which it must often be gropingly applied. To some extent, however, his theory of Natural Law is excess baggage—it is adopted only to be almost explained away. Part of his value theory has a novel and special usefulness: it indicates a cultural matrix from which practical hypotheses of values are drawn. But when subjective conscience is allowed a progressive maturity, apart from results tested and testable in the real world, Maritain constructs an article of faith rather than a tenable political philosophy.

Yet there is something to the idea of the usefulness of untested and untestable overarching cultural values. Dedicated democrats are more likely to preserve their preferred form of government than is an uncommitted and unconcerned citizenry. They are also likely to overstress conformity; on this score, Maritain seems a bit too unconcerned; but Maritain, with fresh eyes, joins the ranks of Locke and Jefferson in seeing occasional need for shaking even democrats from their accustomed ways when the stability of government is a stale veneration of outworn measures, impeding rather than promoting the common good. Maritain's insistence on pluralism and the strength of grass-roots social activity is a one-sided view of a dual problem. He wisely tries to counteract a too ready willingness to turn only to government for just solutions of social problems. He also counsels that hard problems be assigned for solution to agencies which may be less rational and less able to plan than are the arms of national government. Though states sometimes (perhaps often) fail to appreciate local conditions and needs, though some (perhaps many) administrative bodies are inept, overstaffed, and inflexible, the *inevitability* of governmental clumsiness in business, art, and science is an undemonstrated and potentially harmful assumption. Governmental reclamation, reforestation, and agricultural research have borne good fruits that would not have grown from grass roots. Perhaps even these fruits will be larger, more succulent, more economically produced, and more to our tastes when government becomes more sensitive to, and partly supplanted by, men privately self-organized.

NOTES FROM THE ACADEMY

ON THE EVENING of 8 October 1958 the American Academy of Arts and Sciences made its first award of the Emerson-Thoreau Medal to Robert Frost in recognition of his long and distinguished contribution to the creative arts. His response appears below, as revised by him from his words of that evening.

As befitted the eminence of the guest of honor and the importance of the occasion, the House of the Academy was filled. To accord with Mr. Frost's wishes, the atmosphere was informal and the ceremony simple—that of friends honoring a friend. Before dinner he chatted with some of his hosts, and after dinner he escaped for a short cat nap. When he took his place before his enthusiastically applauding audience, it was as a member of the Academy, at home in its House, the man whom Amy Lowell called "a neighbor of neighbors."

What he then said was essentially a conversation with friends. It followed the higher law of his own feeling rather than any formal rules for oral rhetoric, and his idiom was tuned for direct communication with responsive hearers. The printer has no font for the intonation of his voice, the rhythms of his speech, its change of pace, its eloquent pauses. All who were present carried away an indelible impression of the spirit, the personality, and the mind of the poet we were proud to salute.—K.B.M.

On Emerson

ROBERT FROST

ALL THAT ADMIRATION for me I am glad of. I am here out of admiration for Emerson and Thoreau. Naturally on this proud occasion I should like to make myself as much of an Emersonian as I can. Let me see if I can't go a long way. You may be interested to know that I have right here in my pocket a little first edition of Emerson's poetry. His very first was published in England, just as was mine. His book was given me on account of that connection by Fred Melcher, who takes so much pleasure in bringing books and things together like that.

I suppose I have always thought I'd like to name in verse some day my four greatest Americans: George Washington, the general and statesman; Thomas Jefferson, the political thinker; Abraham Lincoln, the martyr and savior; and fourth, Ralph Waldo Emerson, the poet.

I take these names because they are going around the world. They are not just local. Emerson's name has gone as a poetic philosopher or as a philosophical poet, my favorite kind of both.

I have friends it bothers when I am accused of being Emersonian, that is, a cheerful Monist, for whom evil does not exist, or if it does exist, needn't last forever. Emerson quotes Burns as speaking to the Devil as if he could mend his ways. A melancholy dualism is the only soundness. The question is: is soundness of the essence.

My own unsoundness has a strange history. My mother was a Presbyterian. We were here on my father's side for three hundred years but my mother was fresh a Presbyterian from Scotland. The smart thing when she was young was to be reading Emerson and Poe as it is today to be reading St. John Perse or T. S. Eliot. Reading Emerson turned her into a Unitarian. That was about the time I came into the world; so I suppose I started a sort of Presbyterian-Unitarian. I was transitional. Reading on into Emerson, that is into "Representative Men" until she got to Swedenborg, the mystic, made her a Swedenborgian. I was brought up in all three of these religions, I suppose. I don't know whether I was baptized in them all. But as you see it was pretty much under the auspices of Emerson. It was all very Emersonian. Phrases of his began to come to me early. In that essay on the mystic he makes Swedenborg say that in the highest heaven nothing is arrived at by dispute. Everybody votes in heaven but everybody votes the same way, as in Russia today. It is only in the second-highest heaven that things get parliamentary; we get the two-party system or the hydra-headed, as in France.

Some of my first thinking about my own language was certainly Emersonian. "Cut these sentences and they bleed," he says. I am not submissive enough to want to be a follower, but he had me there. I never got over that. He came pretty near making me an anti-vocabularian with the passage in "Monadnock" about our ancient speech. He blended praise and dispraise of the country people of New Hampshire. As an abolitionist he was against their politics. Forty per cent of them were states-rights Democrats in sympathy with the South. They were really pretty bad, my own relatives included.

> The God who made New Hampshire
> Taunted the lofty land
> With little men;—

And if I may be further reminiscent parenthetically, my friend Amy Lowell hadn't much use for them either. "I have left New Hampshire," she told me. Why in the world? She couldn't stand the people. What's the matter with the people? "Read your own books and find out." They really differ from other New Englanders, or did in the days of Franklin Pierce.

But now to return to the speech that was his admiration and mine in a burst of poetry in "Monadnock":

> Yet wouldst thou learn our ancient speech
> These the masters that can teach.
> Fourscore or a hundred words
> All their vocal muse affords.
> Yet they turn them in a fashion
> Past the statesman's art and passion.
> Rude poets of the tavern hearth
> Squandering your unquoted mirth,
> That keeps the ground and never soars,
> While Jake retorts and Reuben roars.
> Scoff of yeoman, strong and stark,
> Goes like bullet to the mark,
> And the solid curse and jeer
> Never balk the waiting ear.

Fourscore or a hundred is seven hundred less than my friend Ivor Richard's basic eight hundred. I used to climb on board a load of shooks (boxes that haven't been set up) just for the pleasure I had in the driver's good use of his hundred-word limit. This at the risk of liking it so much as to lose myself in mere picturesqueness. I was always in favor of the solid curse as one of the most beautiful of figures. We were warned against it in school for its sameness. It depends for variety on the tones of saying it and the situations.

I had a talk with John Erskine, the first time I met him, on this subject of sentences that may look tiresomely alike, short and with short words, yet turn out as calling for all sorts of ways of being said aloud or in the mind's ear, Horatio. I took Emerson's prose and verse as my illustration. Writing is unboring to the extent that it is dramatic.

In a recent preface to show my aversion to being interrupted with notes in reading a poem, I find myself resorting to Emerson again. I wanted to be too carried away for that. There was much of "Brahma" that I didn't get to begin with but I got enough to make me sure I would be back there reading it again some day when I had

read more and lived more; and sure enough, without help from dictionary or encyclopaedia I can now understand every line in it but one or two. It is a long story of many experiences that let me into the secret of:

> But thou, meek lover of the good!
> Find me, and turn thy back on heaven.

What baffled me was the Christianity in "meek lover of the good." I don't like obscurity and obfuscation, but I do like dark sayings I must leave the clearing of to time. And I don't want to be robbed of the pleasure of fathoming depths for myself. It was a moment for me when I saw how Shakespeare set bounds to science when he brought in the North Star, "whose worth's unknown although his height be taken." Of untold worth: it brings home some that should and some that shouldn't come. Let the psychologist take notice how unsuccessful he has to be.

I owe more to Emerson than anyone else for troubled thoughts about freedom. I had the hurt to get over when I first heard us made fun of by foreigners as the land of the free and the home of the brave. Haven't we won freedom? Is there no such thing as freedom? Well, Emerson says God

> Would take the sun out of the skies
> Ere freedom out of a man.

and there rings the freedom I choose.

Never mind how and where Emerson disabused me of my notion I may have been brought up to that the truth would make me free. My truth will bind you slave to me. He didn't want converts and followers. He was a Unitarian. I am on record as saying that freedom is nothing but departure—setting forth—leaving things behind, brave origination of the courage to be new. We may not want freedom. But let us not deceive ourselves about what we don't want. Freedom is one jump ahead of formal laws, as in planes and even automobiles right now. Let's see the law catch up with us very soon.

Emerson supplies the emancipating formula for giving an attachment up for an attraction, one nationality for another nationality, one love for another love. If you must break free,

> Heartily know,
> When half-gods go
> The gods arrive.

I have seen it invoked in *Harper's Magazine* to excuse disloyalty to our democracy in a time like this. But I am not sure of the reward promised. There is such a thing as getting too transcended. There are limits. Let's not talk socialism. I feel projected out from politics with lines like:

> Musketaquit, a goblin strong,
> Of shards and flints makes jewels gay;
> They lose their grief who hear his song,
> And where he winds is the day of day.
>
> So forth and brighter fares my stream,—
> Who drink it shall not thirst again;
> No darkness stains its equal gleam,
> And ages drop in it like rain.

Left to myself, I have gradually come to see what Emerson was meaning in "Give all to Love" was, Give all to Meaning. The freedom is ours to insist on meaning.

The kind of story Steinbeck likes to tell is about an old labor hero punch-drunk from fighting the police in many strikes, beloved by everybody at headquarters as the greatest living hater of tyranny. I take it that the production line was his grievance. The only way he could make it mean anything was to try to ruin it. He took arms and fists against it. No one could have given him that kind of freedom. He saw it as his to seize. He was no freedman; he was a free man. The one inalienable right is to go to destruction in your own way. What's worth living for is worth dying for. What's worth succeeding in is worth failing in.

If you have piled up a great rubbish heap of oily rags in the basement for your doctor's thesis and it won't seem to burst into flame spontaneously, come away quickly and without declaring rebellion. It will cost you only your Ph.D. union card and the respect of the union. But it will hardly be noticed even to your credit in the world. All you have to do is to amount to something anyway. The only reprehensible materiality is the materialism of getting lost in your material so you can't find out yourself what it is all about.

A young fellow came to me to complain of the department of philosophy in his university. There wasn't a philosopher in it. "I can't stand it." He was really complaining of his situation. He wasn't where he could feel real. But I didn't tell him so I didn't go into that. I agreed with him that there wasn't a philosopher in his university—

there was hardly ever more than one at a time in the world—and I advised him to quit. Light out for somewhere. He hated to be a quitter. I told him the Bible says, "Quit ye, like men." "Does it," he said. "Where would I go?" Why anywhere almost. Kamchatka, Madagascar, Brazil. I found him doing well in the educational department of Rio when I was sent on an errand down there by our government several years later. I had taken too much responsibility for him when I sent him glimmering like that. I wrote to him with troubled conscience and got no answer for two whole years. But the story has a happy ending. His departure was not suicidal. I had a post card from him this Christmas to tell me he was on Robinson Crusoe's island Juan Fernandez on his way to Easter Island that it had always been a necessity for him some day to see. I would next hear from him in Chile where he was to be employed in helping restore two colleges. Two! And the colleges were universities!

No subversive myself, I think it very Emersonian of me that I am so sympathetic with subversives, rebels, runners out, runners out ahead, eccentrics, and radicals. I don't care how extreme their enthusiasm so long as it doesn't land them in the Russian camp. I always wanted one of them teaching in the next room to me so my work would be cut out for me warning the children taking my courses not to take his courses.

I am disposed to cheat myself and others in favor of any poet I am in love with. I hear people say the more they love anyone the more they see his faults. Nonsense. Love is blind and should be left so. But it hasn't been hidden in what I have said that I am not quite satisfied with the easy way Emerson takes disloyalty. He didn't know or ignored his Blackstone. It is one thing for the deserter and another for the deserted. Loyalty is that for the lack of which your gang will shoot you without benefit of trial by jury. And serves you right. Be as treacherous as you must be for your ideals, but don't expect to be kissed good-by by the idol you go back on. We don't want to look too foolish, do we? And probably Emerson was too Platonic about evil. It was a mere Τὸ μὴ οὔ that could be disposed of like the butt of a cigarette. In a poem I have called the best Western poem yet he says:

> Unit and universe are round.

Another poem could be made from that, to the effect that ideally in thought only is a circle round. In practice, in nature, the circle

becomes an oval. As a circle it has one center—Good. As an oval it has two centers—Good and Evil. Thence Monism versus Dualism.

Emerson was a Unitarian because he was too rational to be superstitious and too little a storyteller and lover of stories to like gossip and pretty scandal. Nothing very religious can be done for people lacking in superstition. They usually end up abominable agnostics. It takes superstition and the prettiest scandal story of all to make a good Trinitarian. It is the first step in the descent of the spirit into the material-human at the risk of the spirit.

But if Emerson had left us nothing else he would be remembered longer than the Washington Monument for the monument at Concord that he glorified with lines surpassing any other ever written about soldiers:

> By the rude bridge that arched the flood
> Their flag to April breeze unfurled
> Here once the embattled farmers stood
> And fired the shot heard round the world.

Not even Thermopylae has been celebrated better. I am not a shriner, but two things I never happen on unmoved: one, this poem on stone; and the other, the tall shaft seen from Lafayette Park across the White House in Washington.

NOTES ON CONTRIBUTORS

KARL W. DEUTSCH, born in Prague in 1912, graduated from the German University in that city in 1934. The following year he studied at London University, and in 1938 was granted the degree of Doctor of Law and Political Science at the Charles University of Prague. The same year he came to the United States. He has taught at the Babson School of Business Administration, the Fletcher School of Law and Diplomacy, Princeton University, the University of Chicago, and the Massachusetts Institute of Technology, besides serving as chief of various research sections in the Office of Strategic Services and in the State Department. In 1954 Harvard University conferred on him the Ph.D degree. Since 1958 he has been Professor of Political Science at Yale University. Among his publications are: *The Political Community at the International Level; Nationalism and Social Communication; Interdisciplinary Bibliography on Nationalism; The Political Community and the North Atlantic Area;* and (with Lewis J. Edinger) *Germany Rejoins the Powers* (in press).

ROBERT FROST, though born in San Francisco, is universally regarded as belonging to New England. The celebration of his eighty-fifth birthday this year confirms in the minds of many the view that already he has superseded the limitations of space and time. Early a student at Dartmouth College and Harvard College, he has been the recipient of numerous honorary degrees, awards, medals, and prizes in this country and abroad. Many times a poet in residence, he has helped form the minds and taste of countless students. The publication of some fifteen volumes of his verse and plays has cumulated in his *Collected Poems,* the most recent edition that of 1949.

JOHN G. KEMENY, born in Budapest, Hungary, in 1926, received the degrees of B.A. and Ph.D. at Princeton University, where for a year he was assistant to Albert Einstein at the Institute for Advanced Study. Since 1954 he has taught mathematics at Dartmouth College. He has been consultant to the Rand Corporation on the use of high-speed computers and the construction of stochastic models, and as Director of the Dartmouth Mathematics Project has engaged in the applications of mathematics to the social sciences. He has been Chairman of the United States Commission on Mathematical Instruction. Besides numerous articles and texts, his publications include: *Introduction to Finite Mathematics; A Philosopher Looks at Science; Finite Mathematical Structures;* and *Finite Markov Chains* (the first and the last two in collaboration with others).

LAWRENCE S. KUBIE, born in New York City in 1896, has long practiced neurology, psychiatry, and psychoanalysis in that city. A graduate of Harvard College, 1916, he studied at Columbia, then received his M.D. degree from the Johns Hopkins University School of Medicine in 1921. Since then he has held teaching posts in various medical schools in this country (i.e., at the Johns Hopkins, Columbia, and Yale universities, and the New York Psychoanalytic Institute). He has served as consultant to governmental and private organizations, and as president of the New York Psychoanalytic Society, as secretary of the American Psychoanalytic Association, and as president of the American

Psychosomatic Society. In the summer of 1959 he retired from private practice in New York City to take charge of the training program in the Sheppard Pratt Hospital in Towson, Maryland. He is the author of *Practical and Theoretical Aspects of Psychoanalysis; Psychoanalysis as Science* (the Hixon Lectures); *The Neurotic Distortion of the Creative Process* (the Porter Lectures); and of some 225 technical articles in neurology, psychiatry, psychoanalysis, and allied fields.

HAROLD D. LASSWELL, born in Donnellson, Illinois, in 1902, is Professor of Law and Political Science at the Yale University Law School. He received the degrees of Ph.B. and Ph.D. at the University of Chicago, then studied at the universities of London, Geneva, Paris, and Berlin. From 1923 to 1938 he taught at the University of Chicago, then came to Yale. From 1939 to 1945 he was Director of the War Communications Research Project at the Library of Congress, and he has been a consultant of various government departments and private organizations, as well as president of the American Political Science Association. His extensive publications include: *World Politics and Personal Insecurity; Politics: Who Gets What, When, How; Power and Personality;* and most recently, *The Policy Sciences: Recent Developments in Scope and Method* (with Daniel Lerner).

WASSILY LEONTIEF was born in 1906 in St. Petersburg (now Leningrad), Russia, where he was graduated from the University of Leningrad. His doctoral degree was conferred by the University of Berlin in 1928. After conducting research at the University of Kiel, he came to the National Bureau of Economic Research in New York, and then in 1931 to Harvard University, where he is now Henry Lee Professor of Economics, Senior Fellow of the Society of Fellows, and Director of the Economic Research Project. His work lies primarily in the field of economic theory and its application to the empirical analysis of the structure of national economies and of their development. He has contributed numerous articles to American and foreign journals, and is the author of *The Structure of American Economy* and *Studies in the Structure of the American Economy.*

DANIEL LERNER, born in New York City in 1917, is Professor of Sociology and International Communication at the Massachusetts Institute of Technology, and a Senior Research Associate of its Center for International Studies. During World War II he served as Chief Editor of the intelligence branch of the Psychological Warfare Division, SHAEF, and as Chief of Intelligence in the Information Control Division of the Office of Military Government, U.S.A. His books include: *Sykewar; Propaganda in War and Crisis; The Nazi Elite; La Quérelle de la C.E.D.* (with Raymond Aron), *France Defeats EDC;* and *The Passing of Traditional Society.*

CLARENCE MORRIS, born in Denver, Colorado, in 1903, is Professor of Law at the University of Pennsylvania, where he is currently engaged in teaching tort law and jurisprudence. He holds an LL.B. degree from the University of Colorado and an LL.M. from Columbia University. In 1930-31 he was a Brandeis Research Fellow at the Harvard University Law School, and in 1958 a Fellow at the Center for the Advanced Study of the Behavioral Sciences.

Besides his many articles in law reviews and legal journals, he is the author of *Morris on Torts: How Lawyers Think*, and has recently edited a compendium, *The Great Legal Philosophers.*

RENATO POGGIOLI, born in Florence, Italy, in 1907, is a graduate of the University of Florence, where he taught for a year. Later he lectured at Wilno and at Warsaw, and after coming to the United States at Smith College and Brown University. Since 1947 he has been at Harvard University, where he is Professor of Slavic and Comparative Literature. His main publications include: *Pietro di Paragone; Il Fiore del Verso Russo; Teoria dell'Arte d'Avanguardia; The Phoenix and the Spider;* and a work now in progress, *The Poets of Russia: 1890-1930.*

S. S. STEVENS, born in Ogden, Utah, in 1906, is Professor of Psychology at Harvard University, and Director of the Psycho-Acoustic Laboratory, an institution devoted to research in hearing and communications. His wide interests include such areas as the philosophy of science, but he has devoted most of his professional efforts to the field of psychophysics. His undergraduate work was done at the University of Utah and Stanford University, and his doctoral degree was conferred by Harvard University in 1933. During the Second World War he served on the National Defense Research Committee, and since then as chairman of the National Research Council, Division of Anthropology and Psychology. He is the author of: *Hearing: Its Psychology and Physiology* (with Hallowell Davis); *The Varieties of Human Physique* (with W. H. Sheldon and W. B. Tucker); and *The Varieties of Temperament* (with W. H. Sheldon). He also is editor of *The Handbook of Experimental Psychology.*

VICTOR F. WEISSKOPF, born in Vienna in 1908, received his doctoral degree from the University of Göttingen in 1931. From then until 1937 he was research associate at the University of Copenhagen and at the Institute of Technology in Zurich. In 1937 he joined the faculty of the University of Rochester, and later the Manhattan Project at Los Alamos. Since 1946 he has been Professor of Physics at the Massachusetts Institute of Technology, and currently is Vice President of the American Physical Society. He has published (with John M. Blatt) a volume entitled *Theoretical Nuclear Physics,* besides his numerous articles in that field.

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